

# The Canadian Medical Association Journal

Vol. 33

TORONTO, SEPTEMBER, 1935

No. 3

## THE SITE OF FORMATION OF THE PHOSPHATASE OF SERUM\*

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THE purpose of this paper is to report certain experiments which were carried out to ascertain the tissues of the body which are responsible for the formation of serum phosphatase.

Phosphatase is the name given to an enzyme which hydrolyzes esters of phosphoric acid. It has been well established by Robison<sup>8</sup> and co-workers that phosphatase is the active agent of the first mechanism whereby bone salt is laid down in the bones. Fell and Robison<sup>2, 3</sup> further pointed out that phosphatase was apparently synthesized by hypertrophic cartilage cells and osteoid tissue of embryonic six-day fowl femora grown in culture media, but it was not clear from their paper whether controls had been set up to preclude the possibility that the enzyme may have been taken up from the chicken serum used in the medium (chicken serum may have very high phosphatase content). If synthesis does occur in such tissue it becomes a question as to whether the phosphatase of adult serum represents a "leaking out" of the enzyme from cartilage or bone.

Phosphatase is by no means confined to bony tissue, nor is it present in the adult animal in largest concentration there, a fact pointed out by Kay,<sup>4</sup> MacFarlane, Patterson and Robison<sup>7</sup> and others. The values for different tissues and fluids of a number of adult dogs are presented in Table I. The estimations were carried out on aqueous extracts of the tissues, the activity of the extract being determined by applying to it the method of King and Arm-

strong.<sup>6</sup> The values obtained are expressed as units per gram wet weight of tissue.

Whether or not the phosphatase in serum functions as an enzyme is not yet certain. That it is being carried in it for the purpose of reaching the liver, through which it is excreted,

TABLE I.  
PHOSPHATASE CONTENT OF TISSUES OF ADULT DOGS  
EXPRESSED AS UNITS PER GRAM WET WEIGHT OF  
TISSUE (U/G)

Tissue	No. of animals examined	Highest U/G.	Lowest U/G.	Average U/G.
1. Whole intestinal mucosa.....	4	450.0	313.0	367.0
2. Epididymis....	3	104.0	88.0	97.0
3. Whole kidney..	5	47.0	23.0	33.0
4. Testis.....	3	17.6	12.6	17.1
5. Pancreas.....	4	17.0	7.2	12.8
6. Ovary.....	2	12.6	4.4	8.5
7. Lung.....	4	6.7	3.7	4.9
8. Adrenal.....	4	8.4	1.7	4.6
9. Liver.....	5	6.6	2.4	4.5
10. Bone.....	6	4.4	0.8	1.9
11. Spleen.....	6	3.8	0.3	1.8
12. Bladder mucosa	3	2.0	0.9	1.4
13. Thyroid.....	4	1.4	0.0	0.5
14. Nerve.....	4	<1.0	0.3	<0.5
15. Muscle.....	6	<1.0	0.1	<0.4
16. Blood serum....	17	0.16	0.02	0.06

seems clear from the investigations of Armstrong, King and Harris<sup>1</sup> on experimental obstruction of the common bile duct—unless it be assumed that the phosphatase in bile is synthesized in liver cells.

The presence of the very large amounts of the enzyme in intestine, epididymis and kidney presented five possibilities: (1) This might represent another channel of excretion for the

\* Read before the Royal Society of Canada, Hamilton, on May 22, 1935.

enzyme. (2) The enzyme might be deposited from serum for specific purposes in these organs. (3) Enzyme might be synthesized locally for a specific purpose and might never reach the circulating blood at all from these points. (4) This might be the place where the phosphatase of serum is synthesized. (5) In the case of the intestine a re-absorption of phosphatase poured out by bile and other intestinal juices might be occurring.

In this investigation we were concerned with the source of serum phosphatase only. It seemed likely that if the source were removed the enzyme content of serum would drop fairly rapidly. Certainly, it should fail to rise if the excretion through the liver were in any way impaired; for it will be recalled that if the common bile duct be obstructed, after four days a one hundred-fold increase in serum phosphatase occurs in nearly every case, while if toxic agents damage the liver a marked but lesser rise occurs. Thus the following viscera were removed in different dogs, and the serum phosphatase followed: (1) small intestine; (2) large intestine; (3) one kidney; (4) both kidneys; (5) spleen; (6) pancreas; (7) liver; (8) all abdominal viscera; (9) epididymes and testes. As has been customary in former work, the phosphatase of the serum is expressed as units per 100 c.c. of serum.

#### EXPERIMENTAL

1. *Serum phosphatase after removal of small intestine.*—The whole of the small intestine was removed with the exception of about three inches of duodenum where the pancreas was attached and one inch of ileum. The mesenteric vessels were first tied off, the gut removed, and then an end-to-end anastomosis carried out.

Table II indicates the course of an experiment in which the animal recovered well from the operation, and remained so, except for the inanition due to absence of the absorbing surfaces of the intestine. Glucose was given intravenously. No fall in serum phosphatase occurred. In two experiments there was a rise in serum phosphatase following extirpation of the small intestine. This rise was accompanied by a positive van den Bergh reaction, and sections of liver showed marked bile staining around the central vein areas. The mucosa of

TABLE II.  
SERUM PHOSPHATASE AFTER EXTIRPATION OF  
SMALL INTESTINE

Day	Units of Phosphatase per 100 c.c. serum	Notes
0	3.8	
1		Recovered well.
2	16.0	250 c.c. 15 per cent glucose in saline. V.d.B. -/-.
4	11.0	250 c.c. glucose solution. V.d.B. -/-.
6	7.2	250 c.c. glucose solution. V.d.B. -/-. Loose yellow-brown faeces.
8	8.0	250 c.c. glucose solution. V.d.B. -/-. Eating all food.
11	3.1	250 c.c. glucose solution. V.d.B. -/-. Eating small amount food.
13	3.8	250 c.c. glucose solution. Well but weak.
14	3.6	150 c.c. glucose solution.
15	3.7	Killed.

*Autopsy.*—Anastomosis well healed. Only 3 inches of small intestine were left. Liver presented no abnormality in gross, but microscopically a very slight cloudy swelling was observed.

the small intestine thus is not the source of the serum phosphatase.

2. *Serum phosphatase after removal of large bowel.*—This operation was carried out in two stages. First a fistula was made from the lower end of the ileum, while the large bowel was tied off and left in place. After 43 days, when the fistula had formed an artificial anus, the large bowel was removed. The phosphatase

TABLE III.  
SERUM PHOSPHATASE AFTER EXTIRPATION OF  
LARGE INTESTINE

Day	Units of Phosphatase per 100 c.c. serum	Notes
0	3.5	All large bowel except about two inches at anal end removed. (See text for description of fistula.)
1	43.0	Recovered well. V.d.B. -/-.
2	35.0	Fairly well.
3	23.4	" "
4	14.5	General condition not good. Get- ting very thin.
5	10.1	General condition poor. Killed.

activity of the serum was 3.5 units at the time of this operation. Table III indicates the course of the experiment from this time on. The rapid and definite rise in serum phosphatase after the large intestine was removed (probably associated with concomitant disturbance of liver circulation) precludes the possibility of the large intestine being the source of serum phosphatase.

3. *Serum phosphatase after removal of one or both kidneys.*—Since removal of one kidney causes the animal no inconvenience, in one experiment the right kidney was removed first, and 43 days after the left kidney was removed. The results of such an experiment are given in Table IV. Although the values fluctuated

TABLE IV.

## SERUM PHOSPHATASE AFTER UNILATERAL AND BILATERAL NEPHRECTOMY

Day	Units of Phosphatase per 100 c.c. serum	Notes
0	16.0	Operation—right kidney.
1	13.5	Very lively—quite well.
2	15.1	" " " "
3	16.7	" " " "
4	21.7	" " " "
5	21.6	" " " "
7	19.4	Stitches removed.
9	12.7	Quite well.
11	17.8	" " " "
15	14.8	" " " "
18	18.4	" " " "
22	24.0	" " " "
25	18.4	" " " "
28	18.6	" " " "
31	17.6	" " " "
35	19.3	" " " "
39	15.2	" " " "
42	12.1	" " " "
43		Operation—left kidney.
44	20.2	Recovery good—quiet.
45	20.0	Eating—Wound clean.
46	18.2	Somewhat weak.
47	16.6	Dog ill.
48	14.0	Acutely ill.
49		Died.

somewhat, no definite fall in serum phosphatase was observed. To make more certain that the kidneys were not supplying phosphatase to the serum, both were removed in another dog, and at the same time the common bile duct tied off. In this case a rapid rise in serum phosphatase occurred. The kidney therefore cannot be the source of serum phosphatase.

4. *Serum phosphatase after removal of the spleen followed by removal of the pancreas.*—The serum phosphatase was estimated daily for two weeks following a splenectomy, after which time a pancreatectomy was carried out on the same animal and the dog placed on insulin. After splenectomy a very slight phosphatase rise occurred, probably due to circulatory disturbance of the liver. The spleen is, thus, not the source of serum phosphatase. Similarly, the pancreas cannot be the source of serum phosphatase, for the amount of the enzyme in

the serum rose from 4 units to 90 units after this organ had been removed for two weeks. The high values reached were due, we felt, to probable fatty changes in the liver, since retrogression occurred after raw pancreas feeding.

5. *Serum phosphatase after removal of the liver.*—Through the kindness of Drs. C. H. Best and E. T. Waters of the Department of Physiology we have been supplied with samples of blood taken from hepatectomized dogs. The results of four experiments are presented in Table V.

TABLE V.

## SERUM PHOSPHATASE AFTER HEPATECTOMY

Time after operation	Units of Phosphatase per 100 c.c. serum			
	Expt. 1	Expt. 2	Expt. 3	Expt. 4
Hours				
0	—	—	3.8	3.7
7	—	—	—	26.3
9½	—	—	—	30.5
10	—	—	27.0	—
12¼	—	—	—	37.3
15	—	60.0	—	—
18	18.0	—	—	—

In all cases marked rises occurred in serum phosphatase, which could not have taken place had the liver been responsible for supplying the enzyme to serum.

6. *Serum phosphatase after removing nearly all of the abdominal viscera.*—It was considered possible that the serum phosphatase might be supplied in part from each of the several organs containing the enzyme, and that if only one of these was removed no change would be detected. Since in an evisceration experiment the liver would be removed no excretion of phosphatase could occur through this channel. If the source of phosphatase had not been removed then the amount in serum should rise in a manner comparable to that in hepatectomized dogs. The following viscera were removed: stomach and intestine; liver; spleen; pancreas; both kidneys. In Table VI are presented the phosphatase values of serum. The experiments were exceedingly brief, but in all three a detectable rise in phosphatase occurred. This finding indicates that the source of serum phosphatase is not from the abdominal viscera in general.

7. *Serum phosphatase after removal of the epididymes and testes.*—Both testes and epi-

TABLE VI.  
SERUM PHOSPHATASE AFTER ABDOMINAL EVISCERATION

Time in Minutes	Units of Phosphatase per 100 c.c. serum	Notes
0	A. 5.7	Evisceration complete.
30	7.8	400 c.c. 12.5 per cent glucose and 1 per cent sodium chloride.
60	7.5	
90	11.0	
100	11.3	

Total enzyme removed at operation = 37,000 units.

0	B. 9.3	Evisceration complete. Had just received 100 c.c. 12.5 per cent glucose.
37	19.6	75 c.c. of 12.5 per cent glucose.
60	22.9	75 c.c. of 12.5 per cent glucose.
75	20.5	

Total enzyme removed at operation = 34,600 units.

0	C. 6.0	Evisceration complete. Had just received—
30	6.6	100 c.c. 6 per cent glucose.
60	7.9	100 c.c. 6 per cent glucose.
93	7.6	75 c.c. 6 per cent glucose.

Total enzyme removed at operation = 42,800 units.

didymes were removed in one dog and the enzyme activity of the serum observed for eight days. The animal, after recovering from the anæsthetic, was perfectly well during this time. A very slight increase over the pre-operative value for serum phosphatase took place. Therefore these organs are not the source of serum phosphatase.

#### DISCUSSION

By a process of elimination several organs of the body containing significant amounts of phosphatase have been ruled out as the source of the enzyme in serum. While it is possible the source might be from some tissue itself relatively poor in phosphatase content, this seems unlikely and has not been investigated. The obviously crucial, but impossible, test would be the removal of all the bones. Observations on amputation cases yielded negative results, as did also a comparison of the venous and arterial

supply to the lower limbs. The latter was to be expected, since it was found that only about 1,000 units of phosphatase were excreted daily in the bile. If this represents the whole excretion, then by calculation it can be seen that the small amount of enzyme leaving the bone could not be detected by present methods. In the case of amputations the bone removed no doubt represents too small a fraction of the skeleton to cause observable changes in the serum.

The aforementioned evidence of Fell and Robison<sup>2,3</sup> that hypertrophic cartilage and osteoid tissue synthesize phosphatase, coupled with the observation of Kay<sup>5</sup> that in generalized bone disease the serum phosphatase is abnormally high, taken in conjunction with the present report, points to hypertrophic cartilage and osteoid tissue as the sole sites of the formation of the phosphatase of serum.

#### SUMMARY AND CONCLUSIONS

The following organs have been removed from different dogs and the serum phosphatase content assayed before and after removal: small intestine, large intestine, kidneys, spleen, pancreas, liver, testes and epididymes, all the abdominal viscera except the adrenals and bladder. In no case did the serum phosphatase activity decrease, but frequently an increase took place. This is taken as evidence that these organs do not contribute significantly to the content of this enzyme in serum.

The observations support the contention that bone is the sole source of serum phosphatase.

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## THE DIAGNOSIS OF HEPATIC DISORDERS\*

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THE diagnosis of hepatic disorders has been and will probably continue to be a difficult clinical problem. Apart from jaundice, signs of advanced portal obstruction, or marked enlargement of the liver, with or without palpable irregularities, there are no clinical manifestations of disease, much less clinical syndromes, which immediately attract our attention to the liver in disorders affecting this important organ. It is true that with the aid of liver function tests one can now detect evidence of advanced hepatic insufficiency, but even when these tests are positive one is often left in doubt as to whether the cause of the insufficiency is of intra- or extra-hepatic origin. If the primary cause of the insufficiency is intra-hepatic, treatment is medical, but if it is secondary to an extra-hepatic disorder there are a number of clinical conditions in which surgical treatment may be indicated. Particularly in cases of jaundice, as you well know, the physician has to face this problem in diagnosis and treatment, and often an exploratory laparotomy is recommended to help solve the difficulty. Experience with the use of liver function tests has also shown that these tests may be negative, yet the liver present evidence of widespread disease. This is often the result in secondary malignant disease of the liver, in which case the successful removal of the primary growth or its treatment by some form of radiation therapy can be at the most only a palliative measure. Other methods of examination, therefore, must be used to detect evidence of hepatic disease. With our present methods of investigation, can the clinical diagnosis of hepatic disease, with or without hepatic insufficiency, be made more accurate?

Our conception of different types of hepatic disease and our clinical classification of diseases of the liver have been based upon the pathological changes found in this organ post mortem. The difficulty in correlating the

structural changes found at autopsy in the liver and other organs with the clinical findings made the clinical diagnosis of the different types of hepatic disease a difficult problem. In recent years information gained from tests of liver function in different types of hepatic disease and from the results of experimental work on the liver and biliary tract has broadened our understanding of the physiology of the liver in health and disease. As a result, certain clinical findings have gained significance in diagnosis. We now realize that the liver has a wide margin of safety and a marked capacity for regeneration following injury to its parenchymal cells. The use of liver function tests has taught us that a positive test indicates an impairment of well over 50 per cent—possibly as high as 80 per cent—in its functional efficiency. How can we diagnose hepatic disease in which there is a lesser degree of insufficiency?

Enlargement or atrophy of the liver is a sign of disease of this organ. Its size can be determined by physical examination with sufficient accuracy to make this method of examination of definite value in the diagnosis of hepatic disease, particularly in cases in which liver function tests are normal. The clinical conditions in which the liver is enlarged or diminished in size are known, as are also the structural changes or other factors causing the increase or decrease in size. If an alteration in size of the liver is found, one may conclude it is abnormal and then proceed to ascertain the likely clinical cause of this abnormality. Among the more common causes of enlargement are: venous congestion from cardiac failure, portal cirrhosis in its earlier stages, biliary cirrhosis, obstruction of the common bile duct, syphilis, and secondary malignant disease of the liver. Less common causes are: leukæmia, Hodgkin's disease, hæmochromatosis or pigment cirrhosis, amœbic abscess, chronic malaria, and hydatid cyst.

\* Chairman's Address, Section on Practice of Medicine, Canadian and American Medical Associations, Atlantic City, June 13, 1935.

No attempt will be made to discuss in detail the differential diagnosis of each of these causes of enlargement. I shall confine myself to a discussion of enlargements of the liver in general, and of certain associated clinical findings which can be of help in the recognition of these different conditions. Conditions causing enlargement of the liver may be divided into two main groups: (1) enlargement with visible jaundice; (2) enlargement without visible jaundice. Before discussing further the diagnostic significance of enlargement of the liver, let us consider briefly the diagnosis of jaundice. According to McNee's classification of jaundice, which is the most useful from a clinical standpoint, all clinical causes of jaundice can be shown to belong to one or other of three varieties: (1) obstructive hepatic jaundice; (2) toxic or infective hepatic jaundice; (3) hæmolytic jaundice. When a patient is jaundiced, the first object in diagnosis is to determine the primary mechanism causing the disturbance in bile pigment metabolism: whether it be interference with the outflow of bile, or damage to the polygonal cells of the liver, or increased destruction of the red blood cells. The second object is to determine the clinical cause responsible for the jaundice present.

The diagnosis of a hæmolytic type of jaundice and its clinical cause is comparatively easy. The liver is normal in size or only slightly enlarged, but the spleen is palpable. The stools are normal in colour or darker than normal. The urine may contain urobilin, but no bile. The van den Bergh test gives an indirect reaction. No disturbance in liver function is present.

The problem in diagnosis between obstructive hepatic and toxic or infective hepatic types of jaundice is more difficult. One difficulty is a failure to differentiate between a primary obstructive jaundice and a primary toxic or infective hepatic jaundice with secondary signs of obstruction. It is not generally realized that, in the majority of cases of acute toxic or infective hepatic jaundice, signs of obstruction to the outflow of bile are present for a brief period shortly after the onset of jaundice. Acute infective hepatitis, or so-called catarrhal jaundice, constitutes an example of this secondary type of obstructive hepatic jaundice. To avoid errors in diagnosis, one must secure as accurate an account as possible of the patient's symptoms

before the onset of jaundice and up to the time of observation, noting not only the sequence in the appearance of symptoms, their duration and intensity but the time relationship between their development and the appearance of visible signs of jaundice. A history of lassitude, general weakness, with or without fever, loss of appetite, often followed by nausea or vomiting, commonly precedes the appearance of jaundice in acute toxic or infective hepatitis. While many or all of these symptoms may occur in other conditions, their presence before and persisting after the appearance of jaundice is indicative of an intra-hepatic rather than an extra-hepatic origin of the jaundice. The colour of the stools after the onset of jaundice is also of importance in diagnosis. Normally coloured stools, later paler and often clay-coloured for a few days, followed by stools showing a gradual return to normal colour, are characteristic of acute toxic or infective hepatic jaundice. Diffuse tenderness of the liver is a common finding in acute hepatitis. The presence of local or diffuse tenderness of the liver, apart from venous congestion, suggests intra-hepatic disease. In the absence of hæmolytic jaundice a palpable spleen is additional evidence of this. In toxic hepatic jaundice the urine may show urobilin alone or urobilin and bile. If complete obstruction to the outflow of bile develops urobilin disappears from the urine, but reappears during recovery.

To turn now to primary obstructive hepatic jaundice, one of the common causes is an intrinsic obstruction of the common bile duct by a gall-stone. When the onset of jaundice is preceded by colicky pain, the diagnosis is usually clear. However, a stone may lodge in the common duct without symptoms, and later may cause obstruction and a painless jaundice. If a painless jaundice has been present for a few weeks and the stools are constantly or intermittently clay-coloured, one can exclude a toxic hepatic jaundice with secondary signs of obstruction, and diagnose a primary obstructive hepatic jaundice. The next problem is to determine, first, its clinical cause, and, secondly, the presence or absence of hepatic disease. This latter is essential from the standpoint of treatment. When there is a previous history of colicky pain, with or without jaundice, and particularly when this is combined with a his-

tory of fulness and distress after eating, a stone in the common duct, usually with an associated cholangitis, is the likely cause. In the absence of previous attacks of pain, jaundice or gastrointestinal disturbances, the possibility of carcinoma of the common bile duct or of the head of the pancreas or of the gall-bladder, with involvement of the hepatic bile ducts or common bile duct, should be considered. In the differential diagnosis between malignant tumour and other clinical causes of chronic obstructive jaundice the examination of the spleen is important. A palpable spleen is rarely, if ever, present in obstruction due to tumour.

Having come to a conclusion as to the likely clinical cause of a chronic obstructive jaundice, one must consider the state of the liver before deciding upon operation for the relief of the obstruction, as there may be coexisting disease of the liver which may be a contraindication to immediate operation or operation at a later date. Uncomplicated obstruction to the outflow of bile from stone causes a moderate diffuse enlargement of the liver from distension with bile, but the liver is not tender and there is no enlargement of the spleen. This may be present for some time, and complete recovery follow the relief of the obstruction. Often, however, retention of bile, infection, and possibly other factors result in structural changes in the liver and in disturbances of function. The liver is definitely enlarged, localized tenderness is commonly present, and the spleen is usually palpable. These findings are indicative of intra-hepatic disease. To test the efficiency of the liver in this type of case we have found the galactose test the most useful. In uncomplicated obstructive hepatic jaundice due to stone the test is normal. A positive test in chronic obstructive hepatic jaundice indicates intra-hepatic disease with insufficiency of a degree to contraindicate immediate operation. Unless the functional efficiency of the liver can be improved by medical treatment any thought of operation for the relief of the obstruction should be gravely considered.

In chronic jaundice due to obstruction from tumour definite enlargement of the liver is suggestive of metastases. Secondary infection is much less common, and this may be a factor in explaining the less common occurrence of hepatic insufficiency and of splenic enlarge-

ment with tumour, as compared with stone. The results of the galactose test are within the normal limits given by Bauer, *i.e.*, less than three grams of sugar is excreted in the urine. Where there is definite enlargement of the liver in a case of obstruction of the common bile duct due to carcinoma the advisability of doing a cholecystogastrostomy to relieve the jaundice is questionable.

In certain cases of chronic hepatic disease, often with an accompanying jaundice, marked enlargement of both liver and spleen is present. The spleen may be even larger than the liver. The marked enlargement of the spleen present in this group of splenohepatic or hepatosplenic diseases usually serves to differentiate them from cases of chronic jaundice due to obstruction of the common bile duct. In this connection it should be borne in mind that syphilis may be the cause of enlargement of both liver and spleen. Jaundice may or may not be present. A negative Wassermann test is of particular value in differential diagnosis.

Proceeding now to enlargement of the liver without jaundice, the commonest causes are venous congestion from cardiac failure, secondary malignant disease of the liver, and portal cirrhosis. Cardiac failure as a possible cause can be easily determined. In secondary malignant disease of the liver, it is commonly believed that jaundice occurs in the majority of cases, yet it is equally well recognized that the liver may be grossly enlarged and jaundice be absent. When we exclude extra-hepatic causes of jaundice, such as pressure on the common bile duct from enlarged glands, or involvement of the bile ducts by direct extension of the primary growth, it has been our experience that secondary malignant disease of the liver is not a common cause of jaundice. Among 163 cases of malignant disease involving the liver metastases were the cause of jaundice in approximately 18 per cent. The most probable cause of jaundice in secondary malignant disease of the liver would appear to be pressure on both the hepatic bile ducts from metastases situated at the hilus of the liver. The galactose test is negative, but the dye test may be positive. In a patient with a primary malignant growth in some other region of the body enlargement of the liver without a palpable spleen is the most important clinical finding

suggestive of secondary malignant disease of that organ.

The diagnosis of portal cirrhosis, except in the late stages of the disease when signs of portal obstruction are present, may be a difficult problem. The liver may be enlarged or smaller than normal, but the spleen is almost always palpable. In the earlier stages the liver is always enlarged from hyperplasia of the liver cells. Hepatic tenderness may be present. Urobilin is commonly found in the urine and the van den Bergh test may reveal a latent jaundice. In the absence of jaundice the presence of enlargement of the liver and spleen with urobilin in the urine is indicative of hepatic disease, and suggests portal cirrhosis as a likely cause.

Having discussed enlargement of the liver, let us refer briefly to atrophy of that organ. The whole liver may be smaller than normal, or one lobe, usually the left, may be atrophied. Conditions causing atrophy of the liver are much less common than those causing enlargement, and the clinical significance of a decrease in the size is also much less important in diagnosis. The chief causes of diminution in size of the liver are: acute and subacute necrosis of the liver, commonly referred to as acute yellow atrophy; the atrophic form of portal cirrhosis; and obstruction of the hepatic bile duct. Obstruction of the left hepatic bile duct may result in a complete atrophy of the left lobe of the liver without the development of jaundice or of any other clinical disturbance.

Portal cirrhosis is probably the only chronic condition in which atrophy of the liver is accompanied by symptoms. However, as the liver is more often larger than normal in this condition, enlargement is of greater importance than atrophy in the diagnosis of portal cirrhosis. A small liver, a palpable spleen and urobilin in the urine are the important clinical findings in the diagnosis of atrophic portal cirrhosis.

In acute or subacute necrosis of the liver the clinical history is of greater value in diagnosis

than the examination of the liver. However, the latter may be of help, not only in diagnosis but in prognosis. The following is an interesting case in point.

A few years ago a deeply jaundiced patient in the first months of pregnancy was admitted to hospital. Examination revealed a slight diffuse enlargement of the liver with tenderness. The patient was ordered continuous intravenous glucose treatment. At the end of the third day after the onset of jaundice the liver was no longer palpable; but on the fifth day it was again palpable. It was evident that regeneration of the liver was taking place and that one could offer a more favourable prognosis. The patient recovered, and in the course of the next few months the van den Bergh test and the galactose test gave negative results. In acute necrosis of the liver, a palpable liver is a favourable sign.

#### SUMMARY

Recent studies on the use of liver function tests in different hepatic disorders have shown quite definitely that these tests are of little value in the early diagnosis of chronic hepatic disease. One must still rely on the clinical history and the physical examination of the patient to provide evidence both for the diagnosis and for the determination of the clinical cause.

In this discussion, reference has been made to the importance of the clinical history in the diagnosis of hepatic disease with visible jaundice.

The van den Bergh test is of great value in the diagnosis of latent jaundice.

One of the most constant effects of the structural changes occurring within the liver in chronic hepatic disease is an alteration in its size. The presence of enlargement of the liver would appear to provide one of the earliest clinical signs of intra-hepatic disease. When considered with associated clinical findings this is an important sign in differential diagnosis.

To test the efficiency of the liver in chronic hepatic diseases without jaundice the examination of the urine for urobilin is very helpful.

As the size of the liver can usually be determined with reasonable accuracy by palpation and percussion, the examination of the liver by these methods should receive greater attention in the diagnosis of hepatic disorders.

## THE UREA CLEARANCE TEST COMPARED WITH OTHER RENAL FUNCTION TESTS IN UROLOGY\*

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*Toronto*

A PRELIMINARY report on the urea clearance test in urology by Harding and Urquhart<sup>1</sup> was read at the twenty-ninth annual meeting of the American Urological Association in Toronto, June, 1932. The present paper represents a continuation of that investigation and a comparison of the Van Slyke urea clearance test with other renal function tests commonly employed in urological clinics.

There are many so-called renal function tests, including the estimation of the non-protein nitrogen or blood-urea nitrogen; the phenol-sulphone-phthalein test; the two-hour and water test; the urea concentration test following the administration of urea by mouth; and, more recently, the Van Slyke urea clearance test.<sup>2</sup> It must be remembered that the majority of these tests involve a number of factors of which the actual excretory ability of the kidney is only one. Thus a single estimation of the urea nitrogen or non-protein nitrogen level in the blood is no more a test of renal function than a single estimation of the blood sugar is a test of carbohydrate metabolism.

The level of the blood urea depends on two factors: (1) the production of urea; (2) the excretion of urea by the kidney. In the normal person the excretion of urea keeps pace with its production, so that the nitrogenous constituents of the blood are maintained at a fairly constant level (non-protein nitrogen, 20 to 35 mg. per 100 c.c.: urea nitrogen, 10 to 23 mg. per 100 c.c.). The production of urea can be increased in many ways; as by increased protein intake, partial starvation, or protein breakdown associated with infection and fever, the so-called toxic destruction of protein. The excretory power of the kidney must be sufficient not only to care for a normal urea production but also to take care of the excess urea produced as a result of

cellular damage at the time of operation. In addition, other conditions unfavourable to kidney function, such as lowered blood pressure, dehydration, partial starvation, and infection, are imposed following surgical procedures, and a kidney which can care for a normal urea production may collapse when labouring under such conditions. These are the cases which are treacherous to the urologist and should be detected by proper renal function tests prior to surgical interference.

The urea clearance test, theoretically, should be of value in this connection. It is an expression of the functional activity of the kidney towards urea, and by it one can measure any decrease in the excretion rate of urea. The normal kidney is stated to have an average of 100 per cent clearance, with a range of physiological variation between 70 and 120 per cent. Below 70 per cent the kidney is said to show decrease in its power to excrete urea—a decrease in its functional activity. Van Slyke<sup>2</sup> and his associates found that with clearances between 50 and 70 per cent there is a mild failure of kidney function but no rise in the blood urea or non-protein nitrogen; between 20 and 50 per cent there is moderate failure in function, the blood urea and non-protein nitrogen values often showing moderate increase; below 20 per cent clearance there is severe failure in function, with the usual clinical picture of uræmia and almost always a marked rise in the blood urea and non-protein nitrogen levels. Thus a patient with urinary obstruction, having moderate or severe impairment of kidney function, may show, because of increased urea production, either through increased protein intake or increased cellular breakdown, an initial elevated non-protein nitrogen or blood urea. Under the treatment usual to these cases, namely, rest in bed, restricted diet, high fluid intake, free renal drainage, proper intestinal elimination, and diuretic medicaments, the production of urea is reduced to a minimum and the excretion raised

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to a maximum. The non-protein nitrogen or urea nitrogen levels may return to normal. The underlying impairment in kidney function may, however, remain unaffected and the surgical risk from the kidney standpoint remain unaltered. It was hoped that the urea clearance test would indicate the true state of kidney function in these cases, and it has been employed in conjunction with certain other tests on a further series of urological patients.

The clinical technique of the urea clearance test is simple. The patient in the resting condition receives his usual breakfast, omitting tea, coffee, or milk, as these substances act as diuretics. Drugs of a diuretic nature, or those which may break down into urea, such as ammonium chloride should be avoided. Water may be taken freely and as usual until the commencement of the test, when no fluid nor food is allowed the patient until the completion of the test two hours later. (Van Slyke permits the administration of 200 c.c. water per hour during the test). As it has been shown that clearances with a minimal variation occur between 9.00 a.m. and noon, the test period is usually between 9 a.m. and 11 a.m. At the beginning of the test the bladder is completely emptied and in all doubtful cases a catheter employed. At the end of the first hour the urine is collected and blood removed for an urea estimation. At the end of the second hour the urine is again collected and, from the viewpoint of the patient, the procedure is completed.

From the urine and blood samples obtained the following data can be determined: (1) the volume of urine excreted per minute; (2) the blood urea in mg. per 100 c.c.; (3) the urine urea in mg. per 100 c.c. The maximum or standard clearances can be readily calculated from the above data and expressed in percentage of normal, as described by Van Slyke *et al.*

In our cases the blood urea was determined by the aeration method of Van Slyke and Cullen: 10 c.c. of N/25 hydrochloric acid was usually found sufficient in the receiving tube, with 1 drop of 0.2 per cent alizarin red as indicator. The non-protein nitrogen was estimated by the procedure of Folin and Wu. In the majority of tests the urine was collected by means of a retention catheter, either urethral or suprapubic. In other cases a catheter was not necessary. Each time the urine was col-

lected the connecting tube between the catheter and container was disconnected and drained into the container. The reaction of the urine was also determined.

The urine urea was estimated in the same way as the blood urea. The urine was diluted with distilled water 1:10; 3 drops of indicator and 25 c.c. of acid were used. The urine ammonia was determined on undiluted urine. The urine urea and ammonia were determined within two or three hours after collection, although time was found not to be an important factor if the urine was placed in a refrigerator. With low temperatures non-infected urine showed no loss of urea at the end of forty-eight hours; but infected urines exhibited changes from day to day wherein the urea slowly decreased and the ammonia correspondingly increased. There was very little decrease in the combined urea and ammonia at the end of twenty-four hours in infected urines when kept in a low temperature.

Table II shows 32 tests in which the clearances were calculated after the ammonia nitrogen of the urine had been subtracted from the total urea and ammonia nitrogen. The clearances were of course all less, the difference being from 1.1 to 34 per cent of the accepted clearance result; the greatest percentage variation occurred in the very low or very high clearances. The average percentage decrease due to this factor was 7. Clearance calculations in this paper are based on urea plus ammonia N of the urine.

The micro method of Conway and Byrne<sup>3</sup> was used for some of the estimations of blood and urine urea. The results, compared to those of venous blood drawn at the same time as the finger blood, were found to be uniformly even. While only 0.2 c.c. of finger blood were required, the difference between the finger and venous blood was less than 2 per cent on the average; the finger blood was usually slightly higher in urea content. The results with urine were not as satisfactory, the percentage difference being as high as 6. The only advantage of the micro method is that a much smaller quantity of blood is required. It is a question whether the collection of the blood from the finger is easier or causes less inconvenience to the patient than the usual venous method. With the micro method it is more difficult to

keep the various reagents accurate, and any error during the procedure of the test is, of course, greatly magnified. In the estimation of urine urea no advantage was found with the micro method.

The phenol-sulphone-phthalein tests were carried out as recently modified and improved by Young *et al.*,<sup>4</sup> the corresponding phthalein test being done on the same day as the clearance test. The results are charted on graphs.

Table I summarizes these results in relation to percentage clearance.

The 7 deaths in the group with clearance below 30 were all true uræmic deaths. They were for the most part patients who were admitted to hospital in uræmia and whose clinical condition did not warrant surgical interference. One or two were re-admissions of old prostatic cases dealt with in a previous admission. In four cases repeated clearance values were ob-

CHART 1

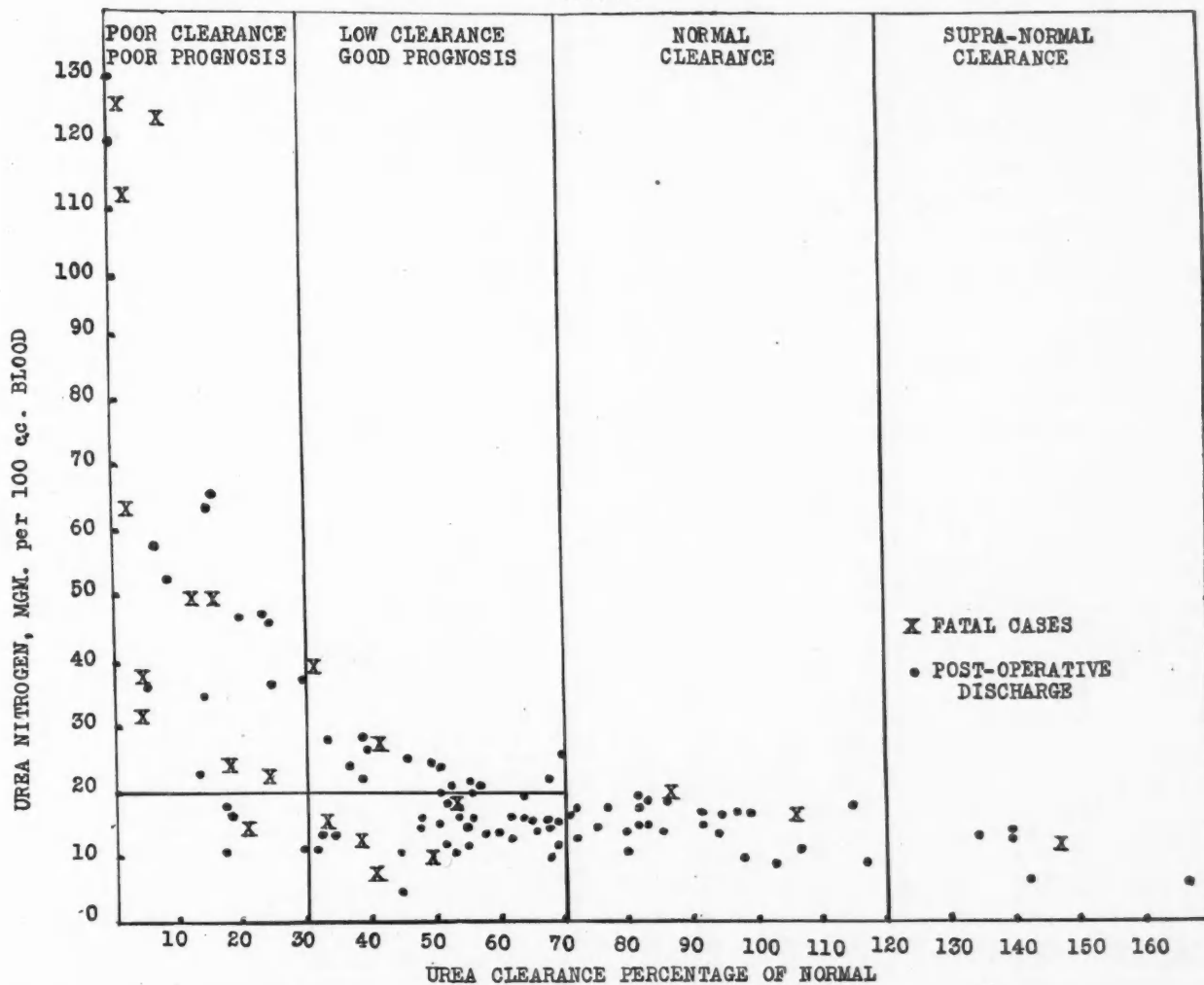


Chart 1 shows the results of 113 clearance tests on 78 patients, of whom 15 died in hospital. The other 63 left hospital, the majority relieved of their urological condition; others improved, and some unimproved.

TABLE I

Initial clearance percentage	Total cases	Deaths	Deaths percentage
Under 30	15	7	46
30 to 70	37	7	16
70 upwards	26	1	4

tained. In each case the subsequent values were lower than that shown in the initial test.

Of the 7 deaths in the second group from 30 to 70 per cent clearance one was an uræmic death during the preparatory period. Two patients died of pneumonia. Four died of cardiovascular disease; three during the pre-operative stage, and one following operation. Previously this patient had improved rapidly. The death in the normal clearance group was due to post-operative coronary thrombosis.

Thus it would appear that the mortality in the group with clearances under 30 per cent is high, and is due mainly to kidney failure. The mortality in the group with normal clearances (over 70 per cent) is low and corresponds very

may be considered as actually a favourable group from the standpoint of surgical prognosis—88 per cent of the cases being successful, the fatalities being due to extra-renal causes.

The urea clearance test in this series thus

TABLE II

Initial clearance percentage	Total cases	Elevated blood urea nitrogen			Normal blood urea nitrogen		
		Total	Deaths	Discharged	Total	Deaths	Discharged
Under 30	15	11	6	5	4	1	3
30 to 70	37	10	2	8	27	5	22
70 upward	26	1	0	1	25	1	24

favourably with the mortality in general surgery for that age group. The mortality in the group with clearances between 30 and 70 per cent of the normal occupies a mid position, namely, 16 per cent of which over one-half were deaths in the pre-operative stage. In other words, the combined group with clearance over 30 per cent

provides some information of prognostic value, namely, first, that when the clearance is below 30 per cent of normal death from uræmia is apt to occur and the clinical progress of those that survive is apt to be stormy. Second, that if the clearance is above 30 per cent of normal the prognosis is good, the fatalities that occur

TABLE III

No. Test (A)	Name (B)	Urea Clearance (C)	Clearance minus Urine Ammonia (D)	Blood Urea (E)	Blood Urea Nitrogen (F)	N.P.N. (G)	Urine Urea (H)	Urine Ammonia (I)	Two Hour Urine Volume (J)	Phenol-sulphone-phthalein Totals (See graph) (K)	Readings (L)	Clinical Result (M)
1	Bickle	41.8	41.0	60	28	29	1524	31	91	Appear. Time		Died. Pneumonia. No operation.
2	Anderson	53.3	52.7	60	28	48	2160	27	81	79%	5 34, 20, 13, 9, 3	Improved greatly with drainage. No operation.
3	Anderson	81.8	79.0	40	18	52	2208	150	83	78%	4 42, 18, 10, 6, 2	Died. Uræmia. No operation.
4	Barr	3.0	2.4	240	112	260	384	82	134			Cured.
5	Windle	86.9	82.2	44	20	59	2040	112	135	77%	4 45, 18, 7, 5, 2	Died. Coronary thrombosis.
6	Brown	171.0	156.4	12	6	40	864	73	214	94%	8 26, 30, 18, 12, 8	Cured.
7	Taylor	36.9	33.8	52	24	32	864	75	174	81%	12 20, 35, 15, 9, 2	Rapid improvement, and cure.
8	Taylor	117.2	100.4	20	9	44	1728	242	70	78%	8 40, 22, 10, 4, 2	Improved. No operation
9	Dick	64.5	60.9	44	20	33	2064	113	70	84%	3 43, 20, 12, 6, 3	Cured.
10	Hill	81.6	79.6	41	19	44	1704	43	143	80%	5 40, 22, 10, 5, 3	Cured.
11	Brown	97.7	91.6	20	10	43	1608	99	56			Cured.
12	Bell	82.9	76.6	40	19	37	2160	163	88	68%	5 10, 40, 8, 5, 5	Cured.
13	Martin	82.6	80.0	32	15	36	1560	50	110	39%	8 5, 8, 15, 7, 4	Cured.
14	Bowman	142.8	136.8	12	6	40	960	41	120			Cured.
15	Carr	92.4	66.5	33	15	44	792	224	350			Cured.
16	Bowles	39.3	32.1	62	29	60	1824	337	68			No improvement after suprapubic drainage.
17	Bowles	39.8	33.8	58	27	46	1848	280	57			Cured.
18	Slee	85.7	83.9	40	19	43	2400	53	76			Cured.
19	Monkman	15.6	14.6	138	64	92	1272	82	110	26%	8 6, 5, 5, 6, 4	Eventually cured. First stage operation after test No. 24. Improved more rapidly on supra-pubic drainage and stood second stage operation very well after test No. 27.
21	Monkman	16.0	15.3	142	66	100	1344	60	108	18%	12 3, 5, 4, 3, 3	Died. Post-mortem proved ruptured aortic aneurysm. Had improved rapidly.
22	Monkman	24.8	23.7	99	46	75	1272	58	154	34%	7 9, 10, 6, 5, 4	Cured.
24	Monkman	39.0	36.9	48	22	48	1104	60	110	51%	8 9, 10, 18, 10, 4	Cured.
25	Monkman	55.1	51.9	34	16	42	1128	65	104			Cured.
27	Monkman	71.4	68.7	36	17	39	1800	68	75	58%	7 14, 20, 11, 8, 5	
28	Monkman	69.2	66.2	26	12	36	960	41	140	69%	5 25, 15, 12, 10, 7	
20	Durrell	34.3	33.8	30	14	39	720	14	80			
23	Durrell	147.7	144.9	26	12	37	3072	57	60	89%	6 30, 25, 20, 9, 5	
26	Durrell	106.6	88.1	36	17	40	1440	251	240			
29	Clark	72.5	70.4	27	13		864	26	196			
30	Lawrence	6.6	4.9	124	58	86	420	112	150			
31	Shortt	19.6	19.2	100	47	80	1128	21	115	17%	14 2, 6, 4, 3, 2	
32	Charters	70.4	69.3	56	26	43	1920	30	155			
Averages of the above 32 results		67.1	62.4 (averaged 7.1% less)				1473	98	123			

being due to extra-renal conditions incident to the age group of the patients.

In Table II a comparison is made between the blood urea nitrogen levels and the clearance values.

Of the 15 cases with clearance under 30 per cent, 11 had elevated blood urea N; 6 of them, as pointed out before, died of true uræmia, the second clearance test in the majority being lower than the first and the blood urea N being higher. The nitrogen levels, however, were lower than usually seen in true nephritic uræmia. Of the remaining five all but one showed marked improvement on subsequent tests. The exception was a man who was discharged unimproved. He had had 5 tests, all giving approximately the same results. Of the 4 cases with normal blood urea N 3 gave improved clearances on subsequent tests. The fourth showed a drop in clearance after the initial test and the blood urea N was elevated. This patient died in uræmia.

Ten cases of the second group of 37 had an elevated blood urea N. There were 2 deaths, one in uræmia. Four of the remaining 8 cases had one or more subsequent clearances with decided improvement in three of them. The fourth was unchanged and this man was discharged unimproved. The blood urea N was also unchanged, although the level was very little above normal. As might be expected, further improvement in clearance was observed in the cases of this group with initial low blood urea nitrogen. In the normal clearance group where further tests were done improvement or no change was seen.

Thus it is evident that an initial clearance below 30 per cent is evidence of a poor diagnosis if the clearance does not rapidly improve on subsequent tests. Further, an elevated blood urea nitrogen when associated with a low clearance (below 30) is evidence of a poor prognosis, unless improvement in both clearance and urea nitrogen is observed on further tests. Clearances above 30 per cent are evidence of good prognosis. Although in the 30 to 70 per cent group, which includes approximately half the admissions, undoubted kidney damage exists it does not appear to be a factor in mortality. In the group with this clearance range, elevation of blood urea N may

occur, but it tends to return to normal with the improvement in the clearance.

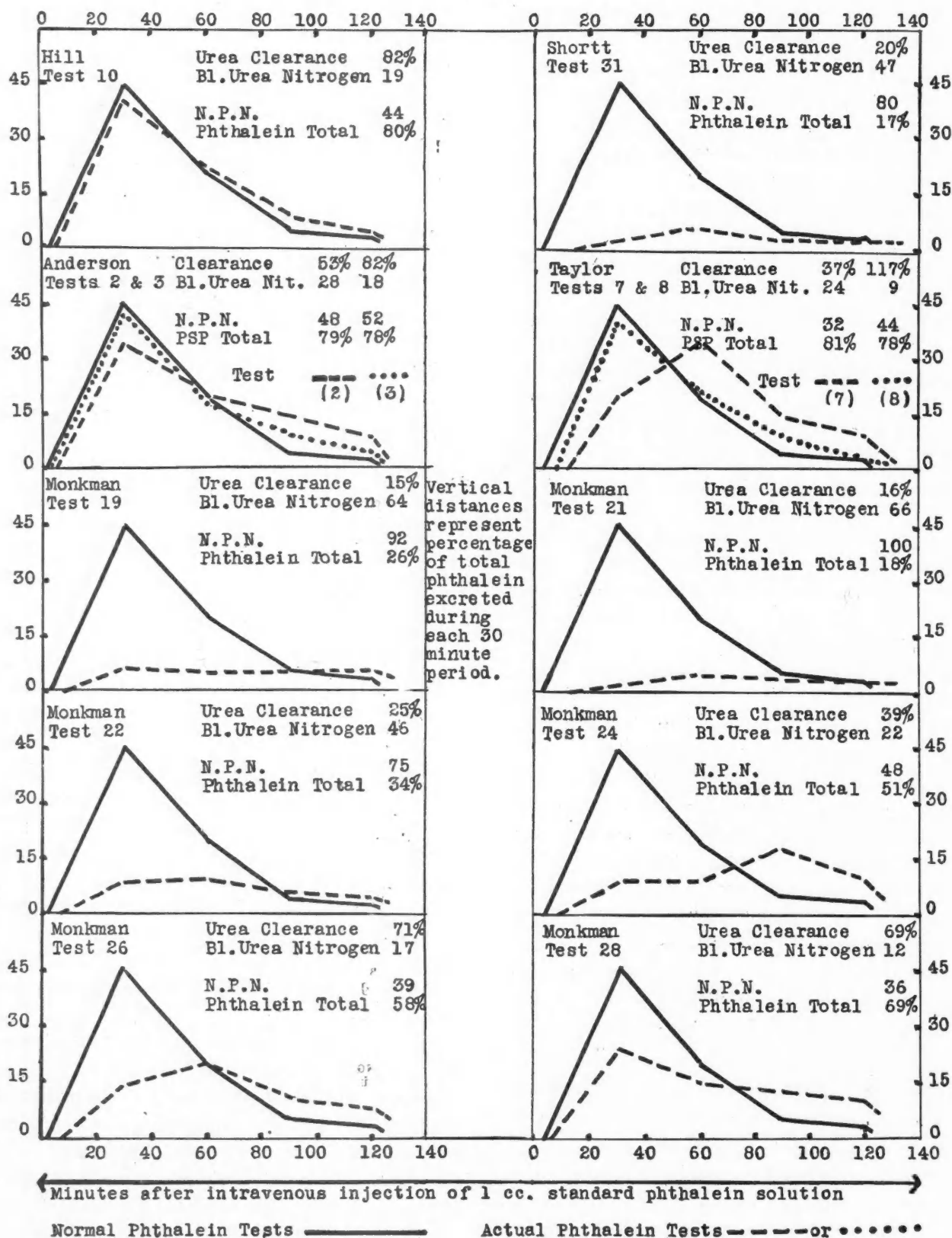
The cases in which the clearance was unchanged on repeated tests presented also constantly elevated blood urea nitrogen, and these patients were discharged unimproved. In Table III, 32 clearance tests are shown in detail. In 18 of these divided phthalein tests are also shown. The 32 clearances represent 21 patients. Repeated tests are listed in the order in which they were done. There were four fatalities in hospital. Three of these were of cardiovascular origin and one uræmic. The post-operative deaths, of which there were three, were due to cardiovascular accidents. The clearance results, as shown in column C, were based on urine urea plus ammonia nitrogen. Those in column D were calculated with the urine ammonia subtracted from the total urine urea and ammonia nitrogen. They were on the average about 7 per cent lower. The blood nitrogen, as shown in column E, corresponds well with the urea clearance results. Improvements in clearance is accompanied by a fall in the urea nitrogen. The non-protein nitrogen also corresponds fairly well with the clearance, although in a few cases improvement in the blood urea and the urea clearance is not mirrored in the non-protein nitrogen. The urine urea, urine ammonia, and the two-hour volumes are also charted in succeeding column.

The phthalein tests, when graphed, correspond very well with the urea clearance results and the blood urea nitrogen determinations. The phthalein totals do not correspond as well as the divided phthalein results.

In Chart 2 ten phthalein tests are graphed against Young's normal phthalein curve.<sup>4</sup> The corresponding urea clearance results, blood urea, non-protein nitrogen and phthalein totals are also shown.

The abscissæ represent the time in minutes following the intravenous injection of 1 c.c. of standard phthalein solution as supplied by Hynson, Wescott and Dunning. The comparative standards used for the determination of the quantity excreted in the urine were prepared from the same source. The appearance time of the phthalein in the urine is the point at which the curve begins to rise. In the normal curve it is charted as three minutes; in test 10 (Hill) it is five minutes, and in test 31

CHART 2



(Shortt) it is 14 minutes. Five specimens were collected during each test, one at each 30-minute interval for two hours after the administration of the dye, and the fifth after a further interval equal to the appearance time.

The ordinates represent the percentage of phthalein excreted by the end of each time interval. The total is determined by adding the percentages in the five samples of urine.

Test 10 (Hill) is an example of a very good phthalein excretion with a normal clearance and blood urea nitrogen level, but with a slightly elevated blood non-protein nitrogen. Test 31 (Shortt) shows a very poor phthalein curve, with an appearance time of 14 minutes and a total dye excretion of only 17 per cent. The clearance is poor, the blood urea and non-protein nitrogen are both high. Tests 2 and 3 (Anderson) show the improvement obtained after urinary drainage, as also do tests 7 and 8 (Taylor). The second phthalein curve in each case more nearly approximates the normal. The phthalein totals do not show a corresponding improvement, and therefore may be misleading. It is to be noted that both the clearance results and the blood urea nitrogen show a corresponding improvement, while the blood non-protein nitrogen becomes slightly elevated.

The six tests of Monkman demonstrate the gradual improvement in renal function during a prolonged period of urinary drainage. At test 19 the patient was apparently on the verge of uræmia. He improved sufficiently on treatment to recover from a second suprapubic operation and to leave hospital markedly improved. In general, the urea clearance, the blood urea and non-protein nitrogen confirm these observations.

It would appear therefore that the divided phthalein test is of value in that it provides evidence as to the state of kidney function. Alteration in kidney function may be recognized by the changes in the curve in successive divided phthalein tests. The repeated test therefore is of more value than a single estimation.

#### CONCLUSIONS

A series of 113 clearance tests has been done on 78 patients. In addition concurrent blood urea and non-protein nitrogen determinations have been obtained in the whole series. In a small group divided phthalein tests have been carried out in conjunction with the above determinations. The usual technique was followed throughout. No practical advantage was found in the use of the micro method of Conway and Byrne for blood and urine urea. In this series repeated blood urea nitrogen determinations were found to be as efficient from the standpoint of prognosis as repeated urea clearance determinations. The degree of kidney damage demonstrated by moderately subnormal clearances did not prove to be an appreciable factor in the operative risk. In the group with very low clearances and consequently poor kidney function the repeated blood urea nitrogen determinations plus the clinical state of the patient gave ample warning of impending danger. The deaths in the series were almost evenly divided between renal and extra-renal causes. The renal deaths were for the most part pre-operative, and surgery was not attempted because of the condition of the patients.

The divided phthalein test is of value in the estimation of the kidney function. It gives results comparable to the urea clearance, and is perhaps a little more adapted to use in a general hospital. In common with the other tests in this series it is the direction of change in successive tests that is of significance from the standpoint of prognosis rather than the individual test itself.

The authors wish to express their indebtedness to the late Professor V. J. Harding, at whose suggestion this work was begun. They regret that due to his untimely death the work had to be completed without the benefit of his inspiration and invaluable criticism.

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## ON THE FREQUENCY AND AGE INCIDENCE OF DUODENAL DIVERTICULA

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FOR a number of years it has been my custom to examine the cadavera that find their way into the Anatomy Department for the presence or absence of duodenal diverticula. A somewhat unique collection of specimens is the result. It includes the largest (I believe) duodenal diverticulum yet recorded (Fig. 8); and it leads to the conclusion that these out-pouchings of the duodenum occur very much more commonly than is supposed.

Duodenal diverticula occasionally involve all the coats of the gut wall, and so resemble a Meckel's diverticulum in structure. This type is said to occur at the site of an ulcer especially in the first part of the duodenum, or to result from traction occasioned by adhesions. Usually, however, the wall of the sac is composed of mucous membrane, including the tunica muscularis mucosæ, which has become herniated throughout the circular and longitudinal muscle coats. Many theories as to the etiology of this second type have been put forward.<sup>1</sup> All the diverticula described in this paper are of the latter hernial type. As the majority of duodenal diverticula grow from the concave, pancreatic border of the duodenum, which, morphologically, is its mesenteric border, and conceal themselves in the head of the pancreas they are very apt to elude detection. In fact, even the largest may pass unnoticed. By the method herein adopted of filling the duodenum with wax even the most obscure sac is made to reveal itself.

*Routine procedure.*—When the dissection of the abdomen has reached an appropriate stage a demonstrator with the assistance of the student removes *en masse* the liver, pancreas, duodenum and pyloric end of the stomach. These are taken to a side room and placed in a tank of warm water. The pyloric end of the stomach is tied. The duodenum is then filled with melted paraffin wax, which is poured into it through the jejunal end of the duodenum. The jejunal end is then tied. Gentle but sufficient pressure is exerted on the jejunal end to ensure that the wax shall flow into any recess or diverticulum that may be present, but never is this sufficient to risk producing a diverticulum artificially. The gall bladder and the bile ducts are now filled with wax injected by means of a syringe, and the whole is transferred to a basin of cold water. The wax hardens, and in consequence any diverticulum that may be

present can now be felt. The student takes the material back to the rooms, dissects the bile and pancreatic ducts and the pancreatico-duodenal vessels, detaches the pancreas, and verifies the absence or presence of a diverticulum. Finally, he incises the gut wall along its convex border, removes the wax cast, and studies both it and the interior of the duodenum.

The earlier specimens in the series were filled with water, and if found to possess diverticula were emptied and filled subsequently with wax. Each year some duodena have escaped us; some have been too much damaged during the dissection to be fit for injection; others have suffered from pathological lesions; others have been of unknown age. All cases have been taken at random; no selection of any sort has been made.

Photographs of seven of the duodena are reproduced here. In order to increase in the reproduction the contrast between diverticulum and gut wall the part of the duodenum adjacent to a diverticulum was in some instances rubbed with graphite, while the diverticulum was touched with white photographic paint.

Of the two tables in the text, one gives the dimensions of the diverticula, the other, their distribution according to age. The dimensions given are less than the dimensions during life, as embalming and heating have caused slight shrinkage. They are, however, made available and are suitable for comparison with others, such as museum specimens, that have been subjected to similar treatment. The ages were obtained from the death certificates.

*Data.*—Of the 133 subjects examined 122 were males; 11 were females. Altogether 15 had single or multiple diverticula; of these 13 were males and 2 females. The ages of the females were 17, 24, 40, 42, 50, 51, 56, 58, 60, 75 and 85 years. The two females with diverticula were aged 58 and 75, respectively.

A dissecting room population is perhaps not entirely representative of the population as a whole, but it is at least representative of a certain social class of the community; and, the fact that diverticula, whether large or small, and whether causing symptoms or not, occur in so considerable a proportion of any section is worthy of attention.

*Age incidence.*—Altogether 133 subjects have been examined. None of the 10 subjects between 17 and 32 years of age had diverticula;

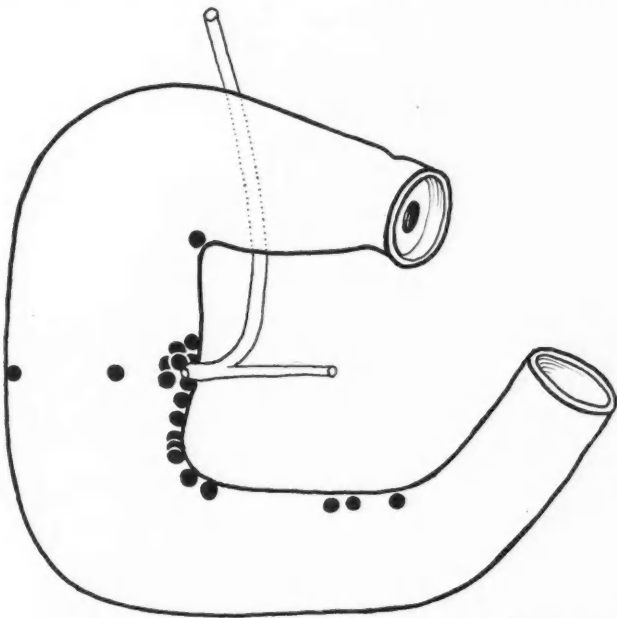


FIG. 1.—Diagram showing sites of the 20 diverticula found in 15 of the 133 duodena investigated.

1 of the 20 between 33 and 42 years, and 1 of the 21 between 43 and 52 years had diverticula. So, of the 51 persons aged 52 years and under 2 had diverticula; they were both males. Four of the twenty-six subjects between 53 and 62 years; 5 of the 30 between 63 and 72 years; 14 of the 19 between 73 and 82 years; and none of the 7 over 82 years had diverticula. So, of the 82 persons over 52 years of age 13 had diverticula. Of these, 11 were males and 2 were females.

TABLE I.

Age groups in years	Diverticula		Proportion of duodena with diverticula
	Present	Absent	
17-22	0	2	0 in 10
23-27	0	3	
28-32	0	5	
33-37	0	8	
38-42	1	11	1 in 20
43-47	1	7	1 in 21
48-52	0	13	
			2 in 51 = (3.9% ± 2.7)
53-57	2	10	4 in 26
58-62	2	12	5 in 30
63-67	2	14	
68-72	3	11	
73-77	3	11	
78-82	1	4	4 in 19
83-87	0	6	0 in 7
88-92	0	1	
			13 in 82 = (15.8% ± 4.0)
Totals	15	118	15 in 133

This Table shows the age distribution of the 133 cadavera investigated for duodenal diverticula, and also the number with diverticula present in each age group. It will be noted that after the age of 52 years the number of duodena with diverticula is about 1 in 6 = (15.8% ± 4.0).

For each decade after the fifty-second year the proportion of duodena with diverticula remains almost constant, at about 1 in every 5 or 6; whereas before this period the proportion is about 1 in 25.5. Though the data are not quite sufficient to allow one to speak with statistical certainty,\* it may with reason be concluded that duodenal diverticula are common after the fifth decade of life, and that they do not become progressively more common with advancing years; that is, the condition would seem to establish itself about middle life.† Duodenal diverticula do at times occur at an earlier stage, as is evident from the fact that they have been operated upon at the age of 27<sup>1</sup> years, and found during post-mortem examinations at the age of 22<sup>2</sup> years.

From the foregoing remarks and figures it is apparent that to say diverticula occur in such-and-such a percentage of persons conveys little if any information, unless the statement bears with it reference to age. A series of data such as this has in itself no inherent interest, except in so far as it enables us to infer that other members of the population are likely to possess diverticula in like proportion. In this connection a fact commonly lost sight of should be called to mind. It is that percentages are not absolute figures. To say that 13 out of 82 persons over fifty-two years old have diverticula is not strictly the same as saying that 15.8 per cent have diverticula. Thirteen out of 82 is not 15.8 per cent, but 15.8 per cent ± its standard error. The standard error is very simply calculated from the usual formula:—  $\sqrt{\frac{P \times (100-P)}{N}}$

where N = the number of duodena examined and P = the percentage with diverticula. The standard error in this instance, therefore, is:—

$$\sqrt{\frac{15.8 \times (100-15.8)}{82}} = \sqrt{\frac{15.8 \times 84.2}{82}} = \sqrt{\frac{1330.36}{82}} = \sqrt{16.22} = \pm 4.0$$

This implies that if another series of persons over 52 years of age be examined, it is probable that 15.8 per cent ± its standard error of 4.0, that is to say, between 11.8 and 19.8 per cent, will be found to have diverticula; and that it is

\* Employing the  $\chi^2$  test.

† Alternatively, it is possible that the underlying cause is a lethal one and that fresh cases do make their appearance during the later decades, but the balance between fresh cases and the death rate maintains an even ratio.

practically certain that 15.8 per cent  $\pm$  twice its standard error, that is to say, between 7.8 and 23.8 per cent, will be found to have diverticula, but that exactly 15.8 per cent will be found again is not probable.

*Sites.*—Of the 15 specimens with diverticula, 11 had 1, 3 had 2, and 1 had 3, making 20 diverticula in all. All save one sprang from the concave, pancreatic border of the duodenum, and all save this one were buried in the substance of the pancreas; and, had the gut not been filled with wax a number of them would certainly have escaped detection.

From the first part of the duodenum there were no diverticula. From the junction of first and second parts there was 1. From the second part there were 14; of these 8 arose around the entrance of the common bile and pancreatic ducts (peri-Vaterine), 1 a centimetre in front of it, 1 two centimetres below it, 2 three centi-

metres below it, 1 four centimetres below it, and 1 from the convex margin. From the junction of the second and third parts there were 2. From the third (and fourth) parts there were 3.

*Shape and structure.*—Of the 20 diverticula 12 were mushroom-shaped (globular), 3 were conical (funnel-shaped), and 5 were tubular. All but one of conical and tubular shape were found around the entrance of the common bile and pancreatic ducts (peri-Vaterine diverticula). Though not sectioned and examined microscopically, it was in most instances apparent with the aid of a lens and probe that these diverticula were of mucous membrane herniated between the fibres of the circular and longitudinal muscle coats, which sometimes were carried on to the neck of the sac for a few millimetres. The specimen springing from the convex border of the second part is also of this nature.

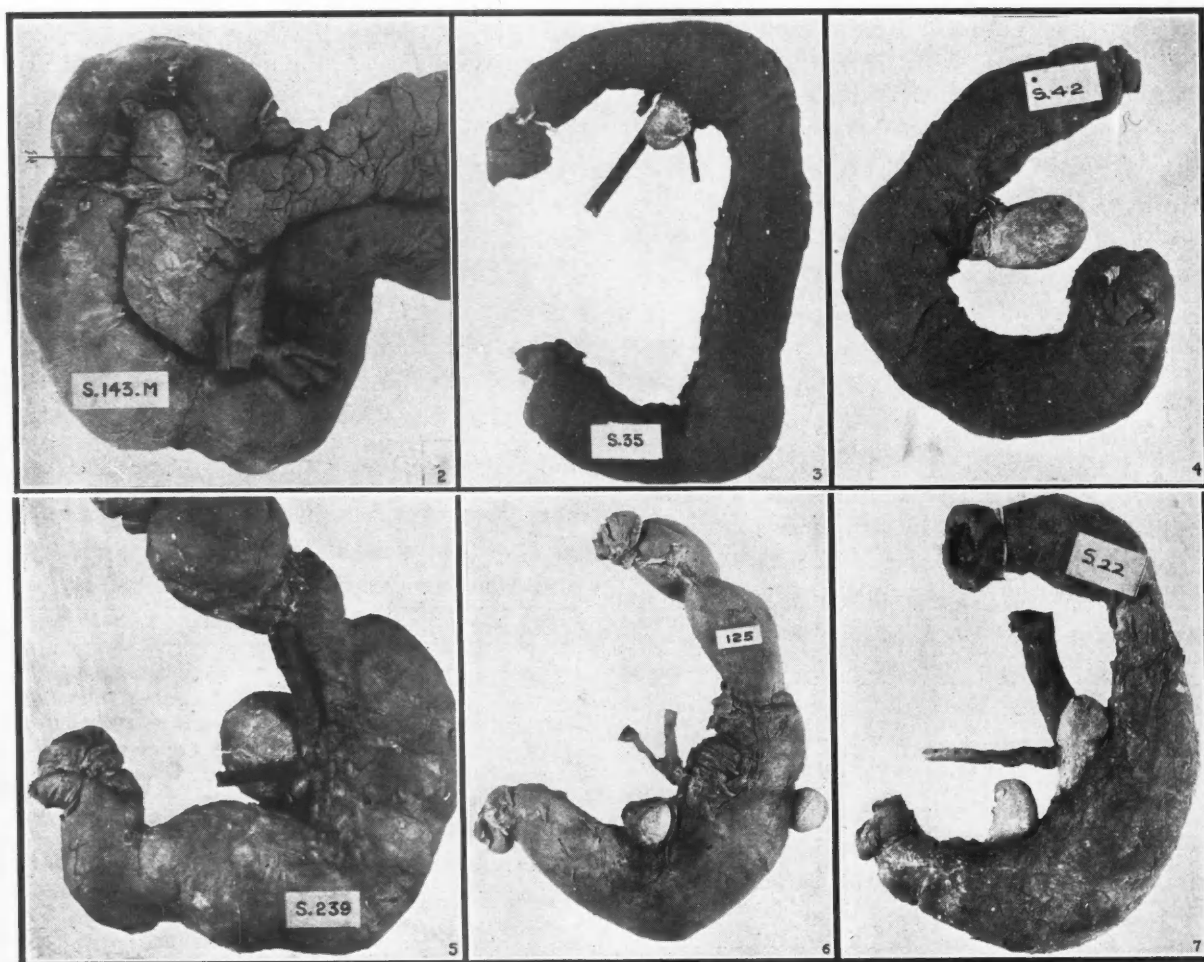


FIG. 2.—Male, age 53, front view. FIG. 3.—Male, age 80, back view. FIG. 4.—Male, age 45, front view. FIG. 5.—Male, age 70, back view. FIG. 6.—Male, age 66, back view. FIG. 7.—Female, age 58, back view.

TABLE II.

Fig. No.	Sex	Age	Maximal diameters in mms.		
			Length	Breadth	Height
Single Diverticula					
2	Male	53	26.0	20.0	24.0
3	Male	80	14.5	12.5	17.0
—	Male	55	13.5	12.5	14.5
—	Male	72	9.5	7.0	17.5
4	Male	45	22.0	20.0	36.0
—	Male	58	13.0	11.0	12.0
—	Male	42	28.0	19.5	25.5
—	Male	73	10.5	6.0	14.5
5	Male	70	18.5	8.5	17.5
—	Male	64	18.0	14.0	11.0
6	Male	66	33.0	26.0	33.0
Multiple Diverticula					
—	Male	70	{22.0	{16.0	{17.0
			{18.0	{16.0	{14.0
—	Male	77	{10.0	{8.0	{13.5
			{15.0	{16.0	{17.0
7	Female	58	{29.0	{13.5	{15.0
			{20.0	{12.0	{12.0
			{16.0	{11.5	{17.5
			{85.0	{39.0	{56.0
8a and 8b	Female	75	{16.0	{21.0	{44.0

This Table gives the maximal measurements of the 20 diverticula growing from 15 of the 133 duodena.

In general corroboration of these findings are the following. Spriggs and Marxer<sup>3</sup> detected duodenal diverticula 38 times in 1,000 consecutive radiological examinations of the alimentary canal. Only two of these patients were under 40 years of age. They saw the shadows grow “in the course of years from a small dot to the size of a walnut or more.” Horton and Mueller<sup>2</sup> record that of 122 duodenal diverticula detected at (post-mortem)

examination at the Mayo Clinic 101 were in patients over 50 years old, 15 between 40 and 49 years old, 5 between 30 and 39 years old, and 1, the youngest found at necropsy recorded in the literature, was 22 years old. They found duodenal diverticula in over 5 per cent of 216 recent necropsies. All these sacs had a tunica muscularis mucosæ. Fraser<sup>4</sup> recorded that jejuno-ileal diverticula, which are similar in structure to duodenal diverticula, and like them grow from the mesenteric border of the gut, usually occur after 40, but may be found in patients as young as 30. And the following interesting observations made by Butler<sup>5</sup> imply an age change. He finds that multiple diverticula of the small intestine appear to originate as traction diverticula at the site of arterio-sclerotic vasa recta, and that they possess all the coats of the gut when small, and burst through the muscle coat only when they enlarge. And, not least are the findings of Baldwin.<sup>6</sup> Among 105 cadavera he found 15 diverticula in 14 duodena. Of the 14 the ages of 9 only were known; the youngest was 47 years old. These diverticula all grew from the concave side of the duodenum. Two were on the pyloric side of the minor papilla; 7 were in immediate relationship to the major papilla; 6 grew from the inferior part. In diameter they are mostly smaller than those in this collection; in shape they fall into the same three groups.

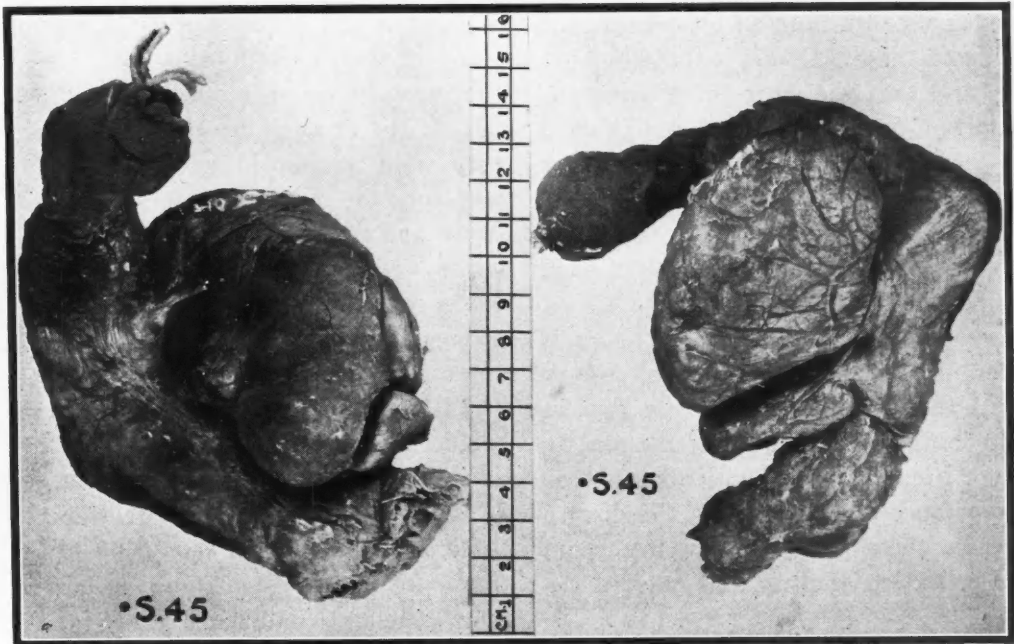


FIG. 8a.—Female, age 75, front view.

FIG. 8b.—Back view.

## SUMMARY

Reproductions of 7 of 15 specimens of wax-injected duodena possessing 20 diverticula are shown; also a Table giving their dimensions, and another giving their age distribution. Among them is (I believe) the largest diverticulum yet recorded. Its diameters are 85.0 x 39.0 x 56.0 mm. All diverticula, save one, sprang from the concave, pancreatic border of either the second or third part of the duodenum. They occurred in the proportion of 1 in 25.5 among 51 persons aged fifty-two years and under; and in 1 in 6.3 among 82 persons over fifty-two years of age. The data suggest that for the most part the condition establishes itself about the sixth decade of life. It is pointed out that on mathematical grounds it is safe to say that when more data are collected it will be revealed

that the percentage of persons over fifty-two years of age that have diverticula will probably be found to lie between 11.8 and 19.8, and certainly, or almost certainly, between 7.8 and 23.8. These figures are appreciably higher than any previously given.

I wish to thank Mr. H. LeMasurier of this Department for the care he has given to the photographic work.

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## THE TREATMENT OF PROSTATIC OBSTRUCTION\*

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WITHIN the past forty years the surgical treatment of prostatic obstruction has come to occupy an increasingly important place in the field of genito-urinary surgery. In spite of this fact there is no unanimity of opinion as to the best method to employ in the management of this condition. My own opinion concerning the relative merits of these methods is that they are all of value, and that the surgeon who intends to do this sort of work should be well versed in all. In this paper I shall summarize my experience with prostatectomy during the past ten years, and shall attempt to analyze the indications, advantages, and disadvantages of each of the principal methods.

The well-regulated prostatectomy of today is a vastly different procedure from that of twenty years ago. Although the difference is due in large part to improvement in technique and to more thorough preparation of patients, another factor of importance is the period of the disease in which we see these patients. Twenty years ago a large proportion of prostaties entered the

hospital with over-distended bladders; today we see with increasing frequency the man with early obstruction and only an ounce or two of residual urine. The symptoms in such cases will consist of nocturia, slight loss of control, slowness of urination, and frequency. Occasionally a hæmorrhage may be the only sign. Many of these patients may be helped by judicious prostatic massage and the use of sandalwood oil. If the urine is infected bladder lavage with very mild antiseptic solutions is helpful. If, however, the residuum persists, and if cystoscopy and rectal examination show the prostate to be definitely enlarged, it may be wise to advise prostatectomy before the condition progresses to a more advanced stage. The risk of operation, which is slight in these cases, but which must be considered nevertheless, must be balanced against the discomfort and the potential dangers of a developing prostatic obstruction. If the retention of urine is greater than two or three ounces operation should be advised, unless there are definite contraindications in the patient's general condition. Even then it may be impossible to evade the issue.

\* Read before the Academy of Medicine, Toronto, February 5, 1935.

## PREPARATION OF THE PATIENT

The first step in the preparation is a thorough study of the patient's general condition. His recent history is important; rapid loss of weight and strength, anorexia, pain, have their significance. Examination of the cardio-vascular situation is of the greatest importance, for in my experience a breaking down of the circulatory system is the most frequent cause of death after prostatectomy. Unless the heart sounds are clear, the rhythm regular, and the systolic blood pressure below 180, it is our custom to have the patient seen by a cardiologist. His point of view is helpful, although experience has shown us that even the best cardiologist cannot always estimate accurately the amount of cardiac reserve, nor can the surgeon foretell which patients will develop surgical complications that will impose an unusually heavy burden upon the heart. The electrocardiogram may give additional warning of impending failure, but it has not proved to be of great value in showing which patients will stand operation well. Not infrequently a heart will behave well before operation, even though serious coronary disease exists; but if, through shock, hæmorrhage or other cause, the blood pressure drops temporarily, the myocardium of such a heart will suffer more from ischæmia than would that of a normal heart, and acute cardiac failure ensues. A loss of blood which would be of little importance in a younger patient may be a serious factor in patients with myocardial weakness. I do not believe that operation should be denied these patients, provided their urinary obstruction is a real factor in their well-being, but one must do everything possible through preparation, selection of the anæsthetic, pre-operative digitalization, and prevention of hæmorrhage, to avoid cardiac injury. In this connection it is worth remembering that the heart muscle is poisoned by toxins and waste products retained in the blood when the kidneys do not function properly; its behaviour can often be seen to improve after a sufficient period of bladder drainage.

The blood pressure should be carefully followed during the period of preparation. O'Connor<sup>13</sup> has called attention to the fact that the blood pressure frequently falls as an over-distended bladder is decompressed, and has advised that operation should not be done until

the blood pressure has been stabilized. His observation that in 35 per cent of the cases of hypertension observed by him in patients with urinary obstruction the blood pressure remained normal for from one to two years after operation suggests that urinary obstruction may sometimes be the cause of hypertension.

The importance of adequate renal function is too well recognized to require much comment. Renal lesions which we encountered in prostatics are of three types, or combinations of these types. They are: (1) dilatation of the pelves and ureters; (2) infection of the parenchyma, either in the form of pyelonephritis or of multiple abscesses; and (3) chronic vascular nephritis. Long-continued back pressure may cause tremendous hydro-ureter and hydro-nephrosis, with marked thinning of the renal cortex, but if the kidney tissue that has survived is essentially sound a period of bladder drainage will bring about marked improvement in the renal function. The blood chemistry should return to normal, the rapidity with which it returns being an indication of the damage which has been sustained. For example, a patient with chronic retention may enter the hospital with a non-protein nitrogen of 100 mg. per 100 c.c. of blood; with adequate drainage of the bladder, the non-protein nitrogen should fall to 40 mg. or less within ten days. A slower return to normal would lead one to suspect very grave renal damage, and would call for a long period of drainage, extending over weeks or months. If infection supervenes in cases with marked dilatation the prognosis is thereby made much worse. Long-established cases of colon bacillus pyelonephritis offer a better prognosis, for with them drainage offers the mildly infected kidney a chance to improve. Infection in the form of multiple abscesses throughout the renal cortex, which has been believed to be due to the staphylococcus, is, I think, almost always fatal in these patients with dilated pelves and ureters and thin renal cortex. It is certainly a frequent finding in cases coming to autopsy, and appears to be a terminal condition. In those cases in which the non-protein nitrogen does not return to normal after several weeks of adequate drainage a true nephritis should be suspected.

The two tests of renal function which are commonly employed in our part of the country

are the determination of the non-protein nitrogen and the phthalein test. As I see them, these tests, although generally in accord, have somewhat different meanings. A normal blood chemistry shows that the kidneys are able, under existing conditions, to free the blood of excessive amounts of waste products; it does not inform us whether the kidneys have any reserve power, and whether under less favourable circumstances they could still keep ahead of waste product accumulation. The phthalein test gives a better idea as to the amount of kidney tissue which is functionally competent. It indicates the extent of renal tissue destruction. The blood chemistry shows whether what tissue there is can scavenge the blood adequately. From the practical point of view I believe the non-protein nitrogen estimation is a more valuable guide than the phthalein test. The latter served its purpose admirably when it was introduced by Rowntree and Geraghty<sup>15</sup> in 1912, for it was the first definite measure of renal function that we had, and was a great comfort to our finite minds. In the prostatic patient, with dilated ureters and pelvis which serve as reservoirs for the recently secreted urine, the phthalein test is far from accurate, for much of the dye may be retained in the upper urinary tract. An output of 40 per cent or more in two hours is a great comfort, since it indicates a fairly normal condition above the bladder, but I would not hesitate to operate with an output as low as 10 per cent, provided this was stable, the non-protein nitrogen was normal, and the patient's general condition was satisfactory.

Examination of the prostate itself should, I believe, consist of two parts—rectal palpation and cystoscopy. By means of rectal examination we should be able to distinguish between the malignant and the benign prostate with at least 90 per cent success. The stony hardness of a malignant prostate is characteristic; the only conditions that resemble it are prostatic calculi and occasional cases of extreme fibrosis. The latter, as I have met them, occur chiefly in young men. It is extremely desirable to differentiate benign and malignant prostates, for the treatment is absolutely different.

Estimation of the size of a prostate by rectal palpation alone may be very difficult. Hugh Young<sup>16</sup> found it to be correct in only 39 per cent of the cases studied in his clinic. Neither is it possible to determine by this means the

degree of obstruction that exists. In the pre-operative study of the prostatic cystoscopy should be done whenever it is possible to pass an instrument through the bladder neck. A No. 16 French observation cystoscope can be passed in nearly every case without undue trauma, especially if the patient has been on catheter drainage for a week or so. In some cases even the findings at cystoscopy are misleading. This is particularly true when the growth has extended beneath the trigone and when it does not project into the bladder. Additional information, particularly as regards the degree of elevation of the median bar and the extent to which the lateral lobes press into the prostatic urethra, can be obtained by means of the McCarthy panendoscope. A No. 20 French sheath may be used in most cases without causing the patient pain or trauma. Bladder tumours, stones, and diverticula should be discovered before operation.

The important facts to be learned from the examination of the prostate are: (1) the degree of obstruction, as evidenced by the amount of residual urine; (2) the presence of malignancy; (3) the cause of the obstruction, whether a fibrous prostate with a median bar or a hypertrophied prostate; if the latter, whether the hypertrophy involves the lateral lobes, the posterior commissure, the middle lobe, or a combination of these.

Pre-operative drainage has been accomplished in 54 per cent of this series by means of the urethral catheter. There is a constantly increasing group of patients with no renal impairment, uninfected urine, and only a few ounces of residuum in whom no preliminary drainage is necessary. Unless there is a great deal of cystitis or an irritable urethra which will not tolerate a catheter, I see no reason to believe that catheter drainage will not accomplish as much as cystotomy. If there is evidence of severe prostatic infection, or if the catheter does not drain the bladder satisfactorily, cystotomy should be done at once.

The value of forcing fluids by the mouth, by hypodermoclysis or by the intravenous route is today acknowledged by everyone. The situation is well summed up by Lashmet and Newburgh,<sup>8</sup> who have shown that diseased kidneys are unable to concentrate urine. Retention of solids, they state, is to be attributed solely to an insufficient intake of water. Coller<sup>4</sup> points out

that after any surgical operation the insensible loss of fluids from skin and lungs amounts to one and one-half litres daily, and to even more when the temperature is elevated. It is essential therefore to provide from 100 to 150 ounces (3,000 to 4,500 c.c.) of fluid daily. Isotonic glucose is said to reduce the toxic destruction of body proteins; it is advisable to add glucose to the fluid intake. The method of administering fluids least uncomfortable for the patient is by vein, but I am sure that in several instances in my experience acute pulmonary œdema has been caused by this method. If the

degeneration of the spermatogenic cells, and that the intertubular tissue is not visibly affected.

#### THE CHOICE OF OPERATION

Three methods of removing the prostatic obstruction must be considered. These are transurethral, perineal and suprapubic.

Transurethral resection, that product of mechanical, electrical, and scientific genius, is in my opinion essentially a complement to prostatectomy, to be employed chiefly in those cases in which typical enucleation of the prostate is impossible. Among these cases I

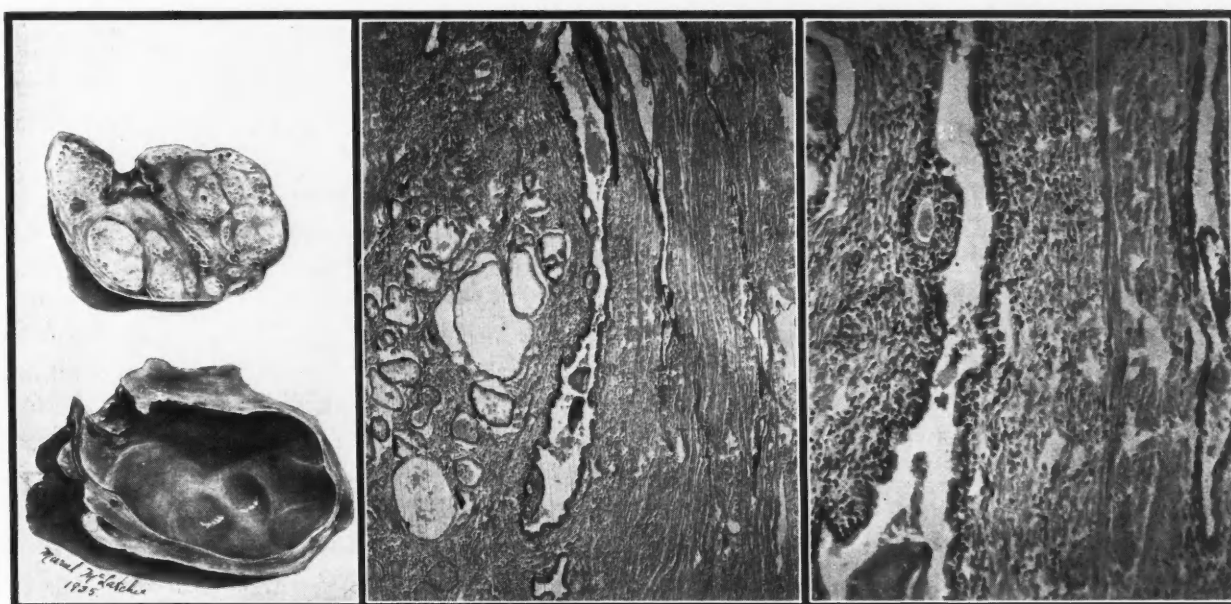


FIG. 1

FIG. 2

FIG. 3

FIG. 1.—Drawing of entire prostate with capsule removed at autopsy. The dark area about the bladder orifice shows where the middle lobe had been resected. The specimen illustrates the extensive hypertrophy which was not affected by resection.

FIG. 2.—Low power photomicrograph of a section removed from the capsule of the prostate after the hypertrophied lobes had been removed, showing compressed prostatic acini.

FIG. 3.—Higher power photomicrograph of a portion of Fig. 2.

heart is normal intravenous administration of fluids is excellent, but with a heart that is on the borderline of failure, the rapid increase of blood volume may be dangerous. In such cases we employ hypodermoclysis.

Vasectomy as a means of preventing epididymitis was suggested by Proust in 1904, and again by Albarran in 1909, but in spite of the high incidence of this complication we did not employ this simple procedure until it was called to our attention once more by Goldstein<sup>6</sup> in 1927. I believe vasectomy should be done in all cases of operation on the bladder neck. The animal experiments of Moore and Oslund<sup>12</sup> have shown that vasectomy does not cause complete

would place certain carcinomata, the small fibrous prostate, some cases in which the obstruction is due to the middle lobe alone, and some early hypertrophies with but a small amount of residuum. Resection may be employed also in cases that have been on suprapubic drainage for a long time, cases in which the prostate fibroses, shrinks in size, and becomes too adherent for enucleation. In all cases of true hypertrophy in which the lateral lobes are affected there is, I believe, more hypertrophied tissue than we realize. The formation of a tunnel through such a prostate by removal of the median bar and the lower, inner quadrants of the lateral lobes may enable

the patient to void more easily than he did before, but it cannot, in my opinion, restore the bladder neck to a condition approximating normal nearly so completely as does prostatectomy. Nor does the prospect of having to undergo later resections appeal to the patients that I see.

The chief difficulty which I have encountered in doing resections has been my inability to know when enough tissue has been removed. In several cases in which resection seemed to have cleared the bladder neck in a thoroughly adequate manner, it later appeared that this was far from being the case. Two patients required subsequent prostatectomy, and a third would have had he lived. This last patient died from pulmonary embolus six days after resection; he had not been able to void at all, yet at resection I thought I had removed very satisfactorily a middle lobe which appeared to be the main reason for his complete retention. At autopsy the prostate showed a great amount of tissue lying between the floor of the urethra and the capsule, and extending beneath the trigone. Removal of this with the resectoscope would have necessitated removal of the trigone as well.

My experience with resection has undoubtedly been too limited to be of much value, for I have used it in only 55 cases. Twenty-five of these were done for benign hypertrophy of slight to moderate degree. Satisfactory results were obtained in 14, fair results in 6, and 3 required subsequent prostatectomy (2, as mentioned above, for obstruction and 1 because of persistent infection in the hypertrophied masses left behind). Two patients of this group of twenty-five died as a result of the resection, one from pulmonary embolus (mentioned above), the other from cardiac failure. In the first case, no source for the embolus could be found at autopsy in the peri-prostatic region. In the second case, a man of eighty, death was due to myocardial failure which developed within a few hours after operation.

Nineteen resections were done for cancer of the prostate. The results in this group were very satisfactory, for the only alternative to resection would have been partial perineal prostatectomy, which is not likely to give relief for long, or permanent suprapubic drainage. In 10 cases the patients were enabled to empty their bladders almost completely; in 4 others the results were only fair; and in one cystotomy was required. The relief obtained by resection was of varying duration; in 3 cases second and even third resections were done, but in 5 a later cystotomy was required. The longest period of relief was something over two years, in a patient who entered the hospital with complete retention but whose retention was completely relieved by resection. Nine of these 19 patients have died, but in none could death be attributed directly to the resection.

In 11 cases resection was done for the removal of small nodules, tabs of tissue, or papillary tumours situated at the neck of the bladder. None of these patients experienced any complications.

I have had a number of resections in which I wished later that I had done a perineal prostatectomy; the risk would not have been appreciably greater and the result would have been more satisfactory. While it is true that the resected patient may leave the hospital in a week or less, his actual return to normal requires fully as much time as after prostatectomy. Secondary hæmorrhage of importance has occurred in only one case, although lesser bleeding has occurred as late as one month after resection. I have had one case of perineal prostatectomy in which I wished I had done a resection; this man had a small fibrous prostate and died of a broncho-pneumonia two weeks after prostatectomy.

It may be that I am all wrong about resection, and that it is possible to remove enough tissue to relieve obstruction in almost any case. The results obtained by Kretschmer,<sup>7</sup> Bumpus,<sup>2</sup> Davis,<sup>5</sup> Alcock<sup>1</sup> and others must be given due consideration. Kretschmer's mortality was 4 per cent in 259 cases; Bumpus' was 1.1 per cent in 451; Alcock's was 0.53 per cent in his last 215 cases. Papin<sup>14</sup> and Caporale,<sup>3</sup> however, seem to be of the same opinion that I am in regard to the indications for resection. Papin calls attention to the fact that after-care is much longer than is generally admitted; he is opposed to the attempt to remove as much tissue as possible. Caporale's views are much the same, although he appears to be rather more enthusiastic. He includes among cases in which resection is indicated the very aged patient and the patient with altered renal function, diabetes, cardiac disease, or chronic respiratory affections. McCarthy<sup>11</sup> considers suitable for resection the small fibrous prostate of the collar type, with small lateral lobes, and the lesser degrees of hypertrophy of the median and lateral lobes. Lowsley,<sup>10</sup> in a review of the prostatic problem, refers to the very large number of resections performed by some operators within the last three or four years, and says: "One may draw only one conclusion, and that is that there are hundreds being operated on who do not need the operation at all". With this opinion we most heartily agree.

The perineal operation has certain distinct advantages and some disadvantages. For the last three years I have been using a hæmostatic bag made by Bard, resembling the Davis<sup>5</sup> bag except that it is of much softer rubber. Since using the perineal bag, I have had surprisingly little hæmorrhage. The pressure of the bag against the bladder neck prevents prostatic ooze from running back into the bladder, and a tight perineal dressing for the first twenty-four hours suffices to control bleeding from the prostatic

cavity. The disadvantages of this operation are the possibility of rectal fistula and interference with the function of the external sphincter. In 215 patients operated upon in the last ten years there have been 7 recto-urethral fistulae. Only two of these were made at operation; both were closed successfully at a later operation. Five resulted from sloughs developing later; 1 was due to necrosis caused by diathermy used to cut down the bladder neck, 1 to the use of radium left in the vesicle after total removal of the prostate for cancer, 1 followed the inclusion of a fold of rectum in the stitch used to approximate the levator ani muscles, and 2 occurred without obvious cause. Two of these were closed by the Young-Stone method; one closed spontaneously; the radium case never healed; and the fifth died of broncho-pneumonia. There was but one persistent perineal fistula, in a man with pyonephrosis.

There have been no cases of permanent incontinence, although a few patients have not regained complete control for several months. In about 75 per cent of these cases complete control is regained before the patient leaves the hospital. The others require a variable length of time for this. Why some do so well as compared with others I do not know. Too forcible retraction of the bulb has seemed a possible cause of injury to the control of the external sphincter. It is important to carry the dissection of the perineum posteriorly to the transverse perineal muscles. There is no limit to the size of the prostate which can be removed in this way. Intravesical enlargements can be turned out through the bladder neck and easily and completely removed. For the small fibrous prostate, which is really best handled by resection, the perineal approach gives a better chance to free the bladder neck than does the suprapubic. In the obese patient the perineal operation is much the easier and avoids the danger of a septic incision in a fat abdominal wall. For malignant prostates it is the only method of approach that should be considered. Total perineal prostatectomy, of which Young and I have each done about 50 cases, is the only method which offers a chance of curing early prostatic cancer. Thirty-three of these cases are included in this series. In the 49 total prostatectomies for cancer which I have done there were 5 hospital deaths. Twenty-three died

of recurrence, having lived an average of 3.2 years; 6 of them lived from six to nine years; 5 died of other causes, without evidence of recurrence, after two, four, five, seven and nine years. Thirteen patients are alive and well, 10 under five years, 3 between five and six years; 3 have not been traced.

In the past ten years, 179 perineal prostatectomies were done for hypertrophy. Of these 10 died, a mortality of 5.6 per cent. Three of these patients required cystotomy because of hæmorrhage; in one case the bleeding was post-operative; in two cases it was secondary, occurring ten and twelve days after operation. All of these were previous to the use of the distensible bag.

Suprapubic prostatectomy is of course the most popular method of attacking the prostate surgically. Even so, there is no uniformity of technique. There is the one-stage wide exposure, with careful trimming of the edges of the bladder neck and hæmostasis by suture of bleeding points. There is the operation advocated in certain cases by Lower,<sup>9</sup> in which the prostatic cavity is obliterated by sutures and the bladder closed tight. The commonest method is the two-stage suprapubic operation, done first by Hugh Young in 1898, in which the hypertrophied lobes are enucleated by blunt dissection with the right forefinger, while with the left forefinger in the rectum the operator raises the prostate and by means of bimanual manipulation, palpates the nodules and effects their removal. One often hears this operation spoken of as total removal of the prostate, but except by accident this is never the case. The capsule, consisting of compressed prostatic tissue, and the posterior lobe are always left in a properly performed enucleation.

The one-stage operation with wide exposure has been done successfully in thousands of cases. If the surgeon is certain that his patient is in excellent condition, with a sound circulatory system and no renal impairment, he is justified in using this method. In recent years I have employed it but rarely, for the reason that I have preferred to do such cases by the perineal method. The one-stage prostatectomy is easier for the surgeon than is the two-stage method, because his enucleating finger is not grasped by the fibrous walls of the preceding

cystotomy incision. I doubt however whether convalescence is materially shorter than with the two-stage operation. The tendency to early removal of the suprapubic tube results, I believe, in moist, infected wounds, which frequently are slow to heal.

The two-stage prostatectomy is a reliable standby. It has the following advantages. If the patient cannot be satisfactorily prepared by catheter drainage preliminary suprapubic drainage can be relied upon to put the bladder at rest, to check bleeding (in almost all cases), and to reduce infection. It can divide the operation into two stages, separated by as long a period as is needed for the recuperation of the patient. From the point of view of anaesthesia, it carries the least risk, for the first stage can be done under local and the second under very brief inhalation anaesthesia, which I believe is the safest method in most instances. When complications exist, such as a large calculus, a tumour, or a diverticulum, suprapubic approach is essential. When suprapubic drainage is established, the kidneys have a chance to re-establish their function; with better elimination of toxins the heart muscle improves. Cystotomy is by no means free of risk. In my experience it is usually more of a tax upon the patient than is the secondary prostatectomy.

The technique of cystotomy is standardized. My only contribution to this phase of prostatectomy (it is undoubtedly as old as the hills) has to do with the filling of the bladder. A catheter is left in the urethra and connected with a reservoir of boric solution. With the bladder empty, the skin and fascia are incised and the rectus muscles are separated and held apart by retractors. Fluid is then allowed to flow into the bladder, which can be seen rising out of the pelvis. When it presents in the wound, the perineum is stripped upwards, the bladder wall firmly secured by Allis clamps or sutures, and the fluid allowed to escape through the catheter. A small incision is then made through the bladder wall, the tube inserted, and the bladder wall inverted about the tube by a catgut stitch. This procedure avoids distension of the bladder for more than a very few moments and adds greatly to the comfort of the patient. There is seldom any leakage when the bladder is opened.

The second stage is of course done through the fistula so formed. One reads a good deal

about the danger of imperfect function following blind enucleation of the prostate, owing to the leaving of tabs of mucosa. In my experience there is practically no danger of this. Function following prostatectomy done in this way is rarely anything but perfect. The actual enucleation of the prostate, provided cases suitable for enucleation are selected, and not malignant or fibrous prostates, should require not more than ten minutes. Haemorrhage is controlled by a haemostatic bag or by gauze packed into the prostatic cavity; a catheter is left in the urethra until the bladder is healed.

Thirty cystotomies were done for cancer of the prostate. Twelve were done for benign enlargement in men who were unfit for the second operation. Of these, 7 died in the hospital or soon after leaving.

In the fatalities in this series cardio-vascular complications were responsible for death in about 50 per cent of all cases. In some of these haemorrhage was a definite factor. Surgical accidents, such as meningitis, embolus and intestinal obstruction, caused death in 4 cases. Septic complications occurred in 2 cases, while nephritis was an important factor in 2.

TABLE  
MORTALITY FOLLOWING OPERATIONS ON THE PROSTATE  
IN THE PAST TEN YEARS

Type of operation	Number of cases	Deaths	Percentage
One-stage suprapubic prostatectomy .....	7	1	14.0
Two-stage suprapubic prostatectomy .....	52	2	3.8
Perineal prostatectomy for benign obstruction	179	10	5.6
Total perineal prostatectomy for cancer ...	33	3	9.0

The lessons which I have learned are: (1) to avoid sudden falls in the blood pressure by the use of smaller amounts of novocain in spinal anaesthesia (60 mg. appears to give satisfactory anaesthesia for perineal prostatectomy), or by employing well-given ether anaesthesia instead of spinal; (2) to exercise care in the selection of cases in which intravenous infusions are given; (3) never to attempt prostatectomy in patients whose non-protein nitrogen does not return to normal. As to the relative merits of the perineal and the suprapubic routes, I believe the choice depends largely upon one's ability to employ either one. The suprapubic

route has fewer pitfalls, but the beautifully smooth convalescence in the average perineal prostatectomy will continue to incline those familiar with this method to its use.

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## ICTERUS NEONATORUM\*

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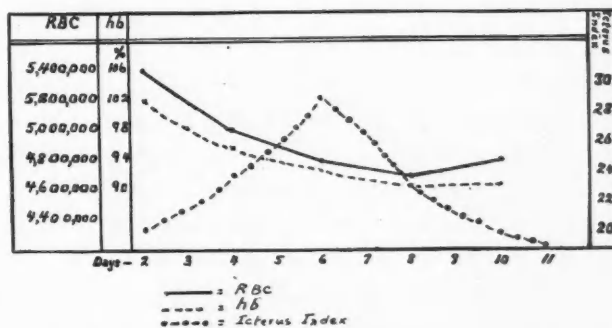
IT is estimated by various writers that from 60 to 90 per cent of the newborn exhibit visible jaundice. This wide variation is probably due to the fact that no uniform method is used for determining its presence. It is not necessary to give a detailed description of this condition, except to say that it generally begins on the second or third day and disappears about the tenth or twelfth. The degree may vary from a faint lemon tint to a deep yellow, and the infant generally suffers no immediate ill-effects.

The cause has not been definitely established, but a large number of theories have been advanced, such as: (1) insufficient function of the liver; (2) increased blood destruction; (3) infectious intestinal catarrh with inflammation of the bile passages; (4) œdema of Glisson's capsule; (5) patulous ductus venosus Arantii; (6) hyperactivity of the reticulo-endothelial system; (7) aspiration of mucus and bacteria; (8) pathological changes in the placenta. Although the real cause is still obscure there are three etiological factors which are worthy of consideration, viz., polycythæmia, fragility, and the state of the liver and spleen at birth.

1. *Polycythæmia*.—At birth there is a marked polycythæmia. This condition gradually subsides and approaches the normal on about the tenth day. Goldbloom and Gottlieb<sup>1</sup> report a

count of 6,900,000 which dropped to 4,250,000 on the seventh day and then rose to 4,500,000 on the tenth day. Counts of over 700,000 have been recorded. This polycythæmia is purely compensatory. The placenta is a very poor agent as an organ of respiration, and the fetus lives in a state of chronic oxygen starvation, just as persons do at high altitudes. The hæmoglobin is correspondingly high (106 to 110 per cent) and gradually approaches the normal, synchronous with the drop in the red blood cell count.

CHART 1



2. *Fragility*.—The red blood cells at birth have a very fragile envelope and break down very readily. This is evidenced by the behaviour of these cells to hypotonic saline solutions. Normally it is found that a saline solution of 0.44 per cent occasions practically no hæmolysis, but a 0.34 per cent solution results in lysis as complete as that caused by distilled water. In

\* Read before the Winnipeg Medical Society, on February 22, 1935.

the case of the red blood cells of the newborn a saline solution of 0.50 per cent is required to keep them from breaking down. It has also been shown that citrated blood taken from the umbilical cord, if allowed to stand in a test tube, hæmolyses rapidly as compared with normal blood. That this phenomenon is due to the extreme fragility of the cell envelope and not to some toxic element in the serum is shown by the fact that the same phenomenon occurs if the blood plasma be replaced by normal saline. This extreme fragility gradually disappears and the cells regain their normal stability on about the tenth day.

3. *The state of the liver and spleen at birth.*—In the first few days of life the liver and spleen are still hæmatopoietic in character, and are not sufficiently mature to properly dispose of the broken-down red blood cells and hæmoglobin.

Theoretically, these three factors alone are enough to produce icterus, and they probably do.

#### PATHOLOGY

The great majority of infants with jaundice are classed in the group of simple physiological jaundice. During the past few decades, however, other types of neo-natal jaundice have been differentiated, and one important variety which has emerged is that termed "icterus gravis".

The incidence of icterus gravis is estimated as 1:340 births.<sup>2</sup> Clinically, the jaundice begins within the first forty-eight hours, and rapidly increases. It usually persists for three to four weeks, and then either subsides or progresses until a fatal termination ensues. Some patients do not live longer than three to four days. Anæmia is very marked from the beginning. The mortality is extremely high, especially in premature infants. In England 1,800 deaths were recorded over a seven year period, due to jaundice of the newborn<sup>3</sup> (probably icterus gravis).

Pathologically, the liver and spleen are often involved, mainly by the deposition of bile pigment and iron. Necrosis of the liver cells and an early fibrosis have been described.<sup>4</sup> Cerebral staining with bile (to which the term "Kernikterus" has been given), particularly of the nuclei in the medulla, is often present, and is responsible for some of the early deaths. Some attribute to this staining<sup>5, 6</sup> the residual nervous manifestations, such as spasticity, athetosis and

mental defects, that one occasionally encounters in patients who have recovered.

In icterus gravis the hæmolytic process, instead of abating, as it does in the simple physiological group, continues unhindered until a marked anæmia results. As a result of this numerous immature red blood cells are present in the blood, megaloblasts, normoblasts and reticulocytes—an indication of intense regenerative activity. In infants who do not die this response eventually results in a return to the normal blood picture. In infants who have died foci of blood-forming tissue have been found all over the body, but particularly in the liver. To this extra-medullary regeneration Rautmann has given the term "erythroblastosis". "These foci resemble the blood-forming areas found in the embryo of about twenty-four weeks, and signify a reversion to the embryonic state, in order to combat the hæmolytic process—the bone marrow being unable to cope with the situation."<sup>4</sup>

Such conditions as hæmolytic anæmias of the newborn "hydrops fetalis"; "erythroblastemia"—are probably different phases of icterus gravis. Before a case can be diagnosed icterus gravis one must eliminate sepsis, syphilis, congenital deformities, obliteration of the bile passages, and familial jaundice.

The questions that naturally arise from the discussion so far are:—What is the relation of the simple physiological jaundice to the grave or malignant form? Can simple jaundice progress into the grave variety? In Nelson's Loose Leaf System it is stated that icterus gravis may arise in the course of a case of simple physiological jaundice. Various investigators have described cerebral staining with bile in the simple physiological group. Ylppö states that the benign jaundice is a physiological process which may become pathological when the blood content becomes excessive. Still, in his text-book on diseases of childhood, states that "In considering physiological jaundice persisting into the second or third week, although the immediate future is favourable, one cannot make general statements as to the ultimate fate of such cases."

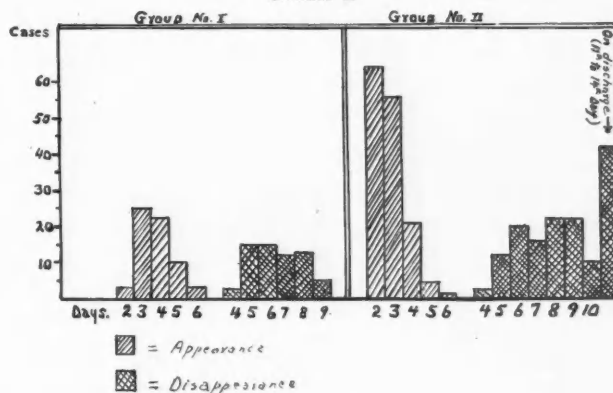
Assuming that there is a likelihood of the physiological jaundice becoming pathological, it would appear that lowering the incidence and severity of the jaundice in newborn infants

should materially help to reduce the occurrence of the malignant type of jaundice. This assumption has led us to investigate and compare the procedure of the immediate tying of the umbilical cord at birth with the present prevalent method of tying the cord after all pulsations have ceased, a matter of 3 or 4 minutes. This idea was advanced by Pfundler and Schlossmann in their text-book (1908), so that it is not a new conception. Through the kind cooperation of the Obstetrical Department at St. Boniface Hospital and various other medical men we had the opportunity of comparing the supposed advantages of the former technique with the latter.

Four hundred consecutive cases were recorded in all. These were divided into two groups of 200 each. In group I the cord was tied immediately upon the delivery of the child, while in group II the cord was not tied until all pulsations had ceased (after 3 to 4 minutes). Careful records were kept of the development of jaundice. The degree of jaundice was graded one, two, three, to denote mild, moderate or marked icterus (visible). This method, of course, is open to question, as it is based on personal opinion, but the observations were

relatively constant and the classification is practical enough for clinical application. In addition, the relationship of each group was recorded as to bleeding and clotting time, gain in weight, dates of appearance and disappearance of the jaundice, primiparous and multiparous births, sex, and the relation to quinine and nembutal.

CHART 2



The main differences in the two groups were:—

1. The marked reduction in the percentage of jaundiced infants in group I.
2. The definite decrease in the degree of jaundice in group I.
3. The large number of infants discharged with jaundice in group II.

*Clotting and bleeding time.*—These were not affected by the immediate tying of the cord. In comparing the two groups there were more cases of prolongation in group II.

*Weight.*—There was no interference in the gain of weight or general well-being of the infants in group I.

*Primiparity, multiparity and sex.*—There is a belief amongst many practitioners and some writers that infants born of primiparae are more prone to become jaundiced than those of multiparae. This was not borne out in our series. There is an opinion that male children were more likely to be jaundiced than female children. This was likewise disproved.

*Quinine and nembutal.*—The exhibition of these two drugs bore no relationship to the incidence of jaundice.

*Prematurity.*—In the whole series there were eleven premature births; 4 in group I, and 7 in group II. All the infants were jaundiced. In group II the jaundice ranged from 2 plus to 3 plus. One premature infant (7½ months), in group II, remained jaundiced for six weeks.

TABLE I.

	Group I. 200 Cases	Control Group II. 200 Cases
Jaundiced	63 or 32%	146 or 73%
Degree		
+	57	101
++	6	18
+++	0	27
Jaundiced on Discharge	0	42 or 29%
Prolonged Bleeding Time	4 or 2%	6 or 3%
Prolonged Clotting Time	4 or 2%	14 or 7%
Weight	Normal gain	
Primipara	66 19 jaundiced or 29%	78 58 jaundiced or 75%
Multipara	134 44 jaundiced or 33%	122 88 jaundiced or 72%
♂ ♀	Equal distribution	Equal distribution
Quinine & Nembutal	No relation to jaundice	No relation to jaundice

At birth it presented clinical evidence of icterus gravis, but this was not confirmed by laboratory tests.

Two of the most extreme cases of jaundice were followed after discharge. One infant is gaining and apparently quite well. The other died at the age of five weeks. It became acutely ill with marked cyanosis, and died within about 8 to 10 hours. It was still slightly jaundiced when it was brought into the hospital. At autopsy, general peritonitis and otitis media were found. No detailed examination of the other organs was made.

The probable explanation<sup>6</sup> for the apparent benefit in group I is this. The cord and placenta contain roughly about 100 c.c. of blood, and the additional amount of blood the infant will receive in group II is about 40 to 50 c.c. For example, let us take a seven pound baby. Its blood volume is 1/20 of the body weight, or 150 c.c. The extra 40 to 50 c.c. of blood that infants in group II receive will overload the circulation by about 25 per cent. This overloading occurs in blood already embarrassed by a polycythemia and increased fragility of its cells, and will naturally tend to exaggerate a

condition which was abnormal to begin with. By excluding this extra amount of blood from the circulation (as in group I) beneficial results should ensue.

#### CONCLUSION

In conclusion, one may state that with the procedure of immediately tying the umbilical cord at birth there is a definite decrease in the incidence and degree of jaundice of the newborn, without any disadvantages to the infant. I would suggest that further work be carried out on larger series of cases in order to corroborate this, or otherwise.

I wish to express my thanks to the Obstetrical, Medical and Nursing Staffs, and other medical men, whose kind cooperation made this work possible, and also to Dr. J. D. Adamson for helpful suggestions.

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### THE PERINEUM AT CHILDBIRTH: REINFORCEMENT OF TISSUES AND A FULCRUM PRINCIPLE\*

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**P**RENATAL care, analgesics, anaesthetics, antiseptics, aseptic technique, proper preparation, and various obstetrical manoeuvres have all contributed to make childbirth a less painful and less hazardous experience. However, one of the unfortunate end-results, even with the greatest care, concerns injuries to the maternal tissues received during delivery, and under this head it is almost impossible to trace the ramifications directly or indirectly due to this cause. One of the commonest accidents or "necessary evils" is the damage to the perineum and pelvic floor during delivery, and it is this one phase of the situation to which attention is invited.

One is sometimes impressed, after reading

descriptions and references to the perineum and pelvic floor, with the idea that it is a necessary but rather futile inert shelf at the lower part of the trunk, to keep things from falling out. Further, it is often considered in the rôle of an obstruction in effecting delivery; something that has often to be squeezed, pushed, cut or torn before the baby may be announced. In reality, it is a symmetrical arrangement of matched pairs of muscles, second only in sheer design to the muscles of the larynx. Even the insertions of these muscles are beautifully effected, to give additional support and expression to their normal activities; the same applies to the fasciæ. These muscles show great physiological and mechanical activity in the course of labour, and are anything but inert. These factors will be considered separately under their respective headings:—physiological notes—with emphasis on the proper-

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ties of muscles; physical notes—dealing with the properties of solid materials.

#### PHYSIOLOGICAL NOTES

Muscle is both extensible and elastic. It can be stretched by a weight, showing its extensibility; when the weight is taken off it returns to its original shape, showing elasticity. The cohesion of muscular tissue is much less than that of tendon or tendinous fasciæ.

In non-living substances, such as a steel spring or India rubber the amount of the extensibility is directly proportional to the weight applied. In the case of muscle this is not true, as each increase in weight is met with more resistance and the degree of extensibility becomes less. In fatigue, the extension is more marked than in a fresh specimen.

The tendency of the muscle to resist extensibility, owing to its elasticity, produces electrical, thermal and chemical changes, and later, fatigue. Where extensibility and elasticity exactly neutralize one another, marks the point where the muscle has expended all its contractile and elastic force. Increased strain beyond this point while contraction is still being attempted will cause a further elongation in the muscle. This extra extension is known as "Weber's paradox", and it is a protective mechanism which tends to prevent rupture in efforts to raise unduly heavy weights. It is this phenomenon in every-day life that makes a muscle give up in the effort to raise a weight beyond its power, instead of keeping on to the point of rupture. Beyond the saving grace of Weber's paradox rupture is inevitable.

Another feature of muscle that is noteworthy is the condition known as tonus. In the living body muscles are stretched from their origins to their insertions, but at rest are never taut or tense. This state of mild stretching is known as muscular tonus. At rest, therefore, a muscle is in the alert position to receive the stimulus for contraction. If a muscle be divided each part contracts, and the parts separate. Muscular tonus is regulated chiefly by nerve supply and to some extent by the nutrition of a healthy blood supply to the parts. If the nerves are divided tonicity is lost and the muscle lengthens out. The same effect may be produced, without cutting the nerve, by the use of curare.

It has also been demonstrated that fewer larger contractions produce more heat and more chemical decomposition and induce fatigue more rapidly than a larger number of smaller con-

tractions to do the same work. For example, ascending a long staircase by fewer but steeper steps induces fatigue readily, but the same height reached by a greater number of gradual and easy steps creates much less experience of fatigue. The muscular work done in both instances is the same, *i.e.*, raising the weight of one's body from the lower to the higher level. The greater the muscular strain, the greater and more prolonged will be the fatigue.

Fatigue of muscle is produced in two ways:—(1) locally—by chemical interference at the end plates of nerves; (2) systemically—by a pseudo-poisoning of the central nervous system. The latter means is regarded as the more important, as the blood of a fatigued animal introduced into the blood stream of a normal one produces fatigue in the second.

A striking illustration of these poisonous products causing fatigue of the brain and central nervous system is demonstrated by the ergograph, in which one finger is allowed free while the other fingers, hand, and arm are fixed in a suitable holder. The free finger repeatedly lifts a weight over a pulley and the height to which it is raised is registered on a recording drum. The result shows gradually diminishing responses, until even under the influence of the will the finger can no longer be raised (although an artificial stimulus by induction shocks will still cause the finger to move). This loss of voluntary control to produce muscular response is frequently seen in the later stages of labour, and is sometimes misinterpreted as failure to cooperate on the part of the patient.

#### PHYSICAL NOTES

The perineal material, considered abstractly and in the purely physical sense as a solid (or semi-solid), will exhibit in common with other solids the following selected properties:—(1) divisibility; (2) porosity; (3) compressibility; (4) elasticity; (5) tenacity; (6) malleability; (7) cohesion. The other properties of solids, ductility and hardness, are omitted as irrelevant.

Considered in the order named, the perineal solid may show divisibility by cutting, tearing or other means of separation. Porosity may be explained by the spaces existing between the ultimate particles of the substance. Such materials as brick, iron, and lead may be proven porous. Compressibility naturally follows the former, for if the individual particles or atoms have space between them, then by compression

the particles may be squeezed closer together and the volume reduced. Elasticity is the property by which matter tends to regain its normal shape or volume when pressure to which it has been subjected is removed. Tenacity is measured by the weight or strain required to break a solid in the form of a strand or fibre. Malleability is the property by which a solid may on pressure be flattened out into plates or sheets. Cohesion is the name given to the electro-chemical attraction existing between molecules of the same nature. Those above mentioned to which attention may chiefly be drawn are, compressibility, elasticity, tenacity, malleability and cohesion.

Pressure from above, applied to a malleable

divisibility is reduced to one-half; (2) the porosity is lessened by one-half; (3) the resistance against further compression is doubled; (4) the elasticity is doubled; (5) the tenacity is doubled; (6) the malleability is doubled; (7) cohesion is doubled.

Another feature worthy of special notice is the following. When a pressure or stress is exerted against a solid at one point there is an indentation or bend at that point, and the side of the solid opposite the pressure-point becomes longer than the side on which the pressure occurs. This is true of all rectilinear bars. In the case of several adjacent bars, with pressure from both sides, the median bar remains in a neutral position and all the others tend to elongate on the side opposite the pressure, the more elongation being

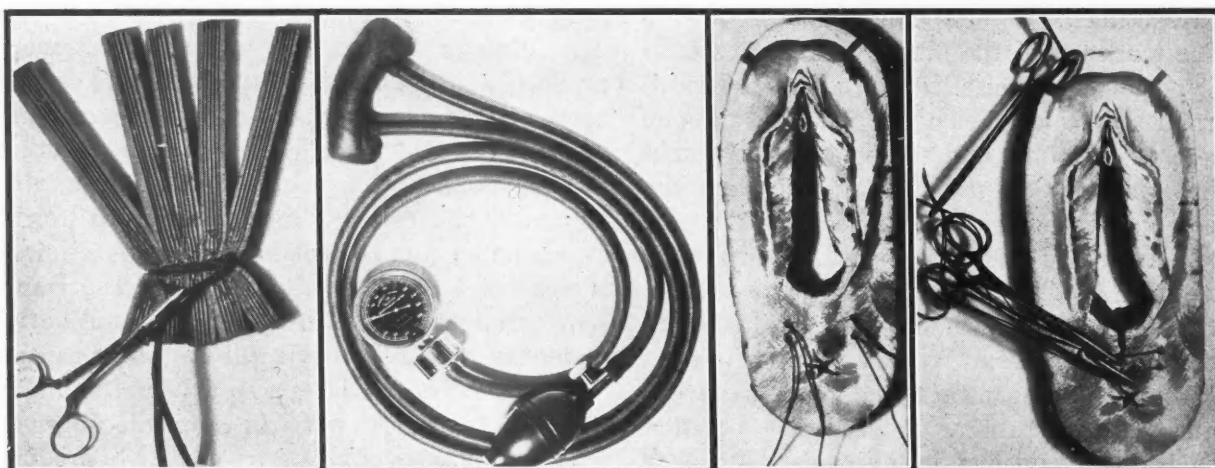


FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 1.—To illustrate the "fan-shaped" effect by circumferential pressure. FIG. 2.—To illustrate gum rubber vaginal balloon with bulb and gauge of sphygmomanometer to measure pressure on perineum. FIG. 3.—Placing of sutures. FIG. 4.—Partially-tied suture with application of artery forceps ready for the delivery.

substance, thins out and stretches the malleable material in proportion to the pressure applied. The greater the pressure, the thinner and weaker the material becomes. The cohesive properties become necessarily diminished, the tenacity comes closer to the point of possible breaking, and the elasticity is gradually strained to its limit. The material then presents the aspect of a frantic effort to preserve its identity. If the pressure is increased still further a dissolution of continuity will occur, in the form of a rupture in the region of the greatest stress. On the other hand, when the material is compressed to one-half its size, the particles are squeezed together and packed into a smaller space. The material, therefore, appears more closely woven and stronger and in reality the following physical effects are produced:—(1) the tendency to

noted on those bars nearest the active pressure, in such a way that a fan-shaped effect is produced. This is illustrated in Fig. 1 by using bars of semi-rigid sponge rubber.

In the case of perineal material, under the same type of pressure, the same facts hold true, *viz.*, that an actual fan-shaped effect is produced, the most mobile and expanded portion being at the vaginal rim, where, fortunately, it is most needed. Another important fact is that reinforcement or pressure of the perineum, applied transversely at a selected point, also causes the tissues so condensed to act as a fulcrum, at which point, under pressure, the superior (anterior) part of the perineum is thrown forwards and laterally, while the lower (posterior) portion is tipped backwards and upwards. This is precisely the condition obtained in the perfect normal delivery.

## APPLIED NOTES AND TECHNIQUE

As the head reaches the pelvic floor the upper or pubic segment of the floor is lifted, whereas the lower sacral segment is forced downward and distended, causing a marked thinning and weakening of all the perineal structures. This continued and extraordinary pressure weakens the perineum, firstly, by overstretching the elastic fibres and rupture of the interlaced connective-tissue fibres in the corium layer of the skin, and, secondly, by an overstretching of the muscle fibres involved to a point where they no longer have the power to exhibit their contractility as muscles but are mere malleable sheets of tissue. Thus the natural resistance to this advancing pressure is removed, and without these supports a state of potential rupture exists. If at this point the pressure still forces onward, the perineal tissue, exhausted, gives up the fight, and the attacking force tears through its thinned-out fabric without any show of resistance. It is a matter of common observation to find tears out of all proportion to the opening apparently necessary for delivery.

This downward pressure against the perineal tissue is somewhat variable, but it may be measured, to determine just how much pressure the perineal tissue may withstand before rupture becomes inevitable. This is done with a crescent-shaped vaginal balloon with two long tubes—one connected with the bulb and the other with the mercury column of an ordinary sphygmomanometer as shown in Fig. 2. A series of readings were made in primiparæ and multiparæ. In the primiparæ the perineum withstood pressures of 200 mm. of mercury easily. Between 200 and 225 mm. was found the best time for episiotomy to be performed. At 225 mm. and over the signs of impending tear appeared, and in no case was 250 reached without a tear.

In multiparæ, with somewhat thinned perineal tissues or previous repairs, the pressures were not tolerated so well and the range of tolerance to pressure was smaller. The average of such cases withstood 180 mm. of mercury well. At over 210 mm. of mercury signs of impending tear appeared and no reading could be made above 225 mm. of mercury without a tear.

If any artificial aid could be introduced to counteract the factors which cause this thinning and weakening of the perineal structure the difficulty and danger of extensive tears might be avoided. There are only two ways to modify the condition. The first is the control of pressure from the advancing head. This may be accom-

plished to a degree by various methods, but sooner or later the inevitable assault must be made on the perineum before delivery can be effected. Secondly, the perineum itself may be considered, and, as it is here that the most marked effects of thinning and weakening are shown and where support is most needed, it is here that the reinforcement and support should be made. This may be effectively accomplished by condensing and reinforcing the tissues of the perineum across the pathway of a median stress.

As the head reaches the perineum and a bulging of the perineum occurs an estimate is made of the amount of stretching taking place at the vaginal rim, and it is also noted whether or not there appears to be reserve for further dilatation. As soon as the head is within sight a No. 3 catgut, about 18 inches long, on a stout curved round needle, is introduced at a point three-quarters of an inch to the right side of mid-line and one-half an inch below the vaginal opening, from the skin surface into the vagina. The needle is then carried across to the left side of the vagina to a point identical with the one on the right and carried through from within outwards. This can be safely done by inserting two fingers into the vagina between the baby's head and the inner wall. There is no risk of injury to any important structure.

The free ends of the catgut are tied across the mid-line with two loops of a surgeon's knot, but without the final knot being made. The head is allowed to force the perineum down again and when the maximum pressure is reached the loops are pulled up snugly and an artery forceps clamped, instead of tying the final knot. (In order to allow for more unusual strain as the head is being delivered the artery forceps clamp is applied one quarter of an inch further away than the knot would have been ordinarily made.) (Fig. 3.) In some primiparæ and in multiparæ with previous bad lacerations and "parchment paper tissues", a second similar reinforcing suture may be placed as a safeguard one quarter of an inch below the first, so that there are two transverse ties.

The free ends of the sutures should be kept up at all times to prevent soiling, and are long enough to pass up through the rings on the handles of the forceps which are acting as clamps. The free ends are then seized with another pair of artery forceps, which in turn are fixed loosely by towel clamps to the drapes in the region of the groin. In this way the sutures are applied and fixed as securely as if already tied, and everything is out

of the actual field. (Fig. 4.) As the head continues to advance, an episiotomy, if necessary, may be performed at the selected time, care being taken not to cut that part of the suture lying transversely in the vagina. (The median episiotomy is the outstanding method of choice from the anatomical, physiological and mechanical standpoint.) At the point of maximum pressure when the head is actually being delivered it will be found that the stay suture continues to condense the tissues and to reinforce the perineum exactly at the point where the strain is greatest. If an episiotomy has been performed it will be found that the incision will be strictly delimited by this transverse suture.

After delivery the forceps attached to the sutures is removed. The knot may be tied, or the suture withdrawn completely. The invariable result is a clean episiotomy wound, the edges of which tend to fall together naturally, affording an easy and rapid repair. The healing of these wounds appears to be more rapid and to cause much less discomfort, which is probably due to the minimum trauma.

The technique in forceps deliveries is the same.

The second, or lower reinforcing, suture would only be used in the most severe cases or where the first suture had been accidentally cut. In cases where an uncomplicated delivery takes place it will be found of great value in supporting the perineal tissues and in its mechanical sense as a fulcrum. Whether or not an episiotomy or instrumental delivery is contemplated, it would appear to be sound practice in all cases to have a reinforcing suture in place for the purpose of supporting the perineal tissues and acting as a fulcrum. If labour should proceed normally without any suggestion of a tear it would merely mean withdrawing the suture.

#### ADVANTAGES OF THE METHOD

1. Simplicity of technique.
2. Perfect apposition of parts.
3. Easy repair.
4. The anatomical, physiological, and mechanical aspects are correct.
5. Uniformity in all cases, manual and instrumental.
6. Strict delimitation and prevention of severe tears.

### LYMPHOGRANULOMA INGUINALE

(WITH A REPORT OF THREE CASES)

BY J. A. BOURGOUIN, B.A., M.D.,

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ACCORDING to DeWolf and Van Cleve,<sup>1</sup> lymphogranuloma inguinale is a specific autonomous, venereal disease which typically involves the inguinal lymph glands in a subacute inflammation. Synonyms are: subacute inguinal lymphogranulomatosis, (Durand, Favre and Nicolas); Nicolas-Favre disease;<sup>2, 3</sup> climatic bubo, tropical bubo, non-venereal bubo; fourth venereal disease; sixth venereal disease, (Stannus<sup>4</sup>); non-tuberculous granulomatous lymphadenitis; subacute inguinal paradenitis, (Destéfano and Vaccarezza); lymphopathia venereum, (Sulzberger and Wise<sup>5</sup>). This last name is suggested because it indicates that the disease is of venereal origin and that it affects primarily the lymphatic tissues. The term also embraces the many extragenital localizations of the disease and atypical forms which we shall refer to later on.

#### HISTORY

Chassaignac, in 1859, and Trousseau, in 1865, gave good descriptions of the disease, but it remained for Durand, Nicolas and Favre, in 1913, to recognize it as an entity. They gave a good histological and clinical description, and also were of the opinion that the condition was of venereal origin. In 1925 Frei<sup>6</sup> brought out his antigen to be used in a specific intradermal test, which is now universally known as the Frei test. In 1931 this disease was the subject of discussion at a symposium of the French Dermatological Society held in Strassbourg.<sup>7</sup> The latest studies on the subject are by H. N. Cole,<sup>8</sup> Martin,<sup>9</sup> and Coutts.<sup>10</sup>

#### THE CLINICAL PICTURE

A characteristic of the disease is the remittent nature of the symptoms. It follows a course

somewhat similar to that of lues, in that periods of active manifestations are followed by intervals of quiescence. As was the case with syphilis, the long-drawn course of the malady, combined with its remittent nature, was for years the chief stumbling-block to those who sought to unravel its life history. In the main, however, we may recognize three stages in its progress. (1) A local lesion mostly confined to the genitalia, rarely met with in extragenital sites. (2) A chronic inflammatory involvement of the lymph glands in the immediate and intermediately remote fields adjoining the site of the primary lesion. (3) Lesions in non-lymphatic tissues which are directly associated with the destruction of lymphatic glands and vessels.

The time interval between the above three stages varies greatly. Owing to our relative lack of understanding of the disease up to the present, the matter of the time element must be accorded a reserved decision. All three stages are not always recorded in any given case. As the clinical picture differs somewhat in males and females, a separate description will be afforded for each sex.

*In the male.*—The primary lesion is usually situated on the glans penis or in the balanopreputial sulcus. It is rather difficult to estimate the length of time elapsing between exposure and the appearance of the primary sore, but according to Hellestrom and other observers the average period is from 10 to 30 days. The lesion is usually small and evanescent. Many patients are unable to give a history of this stage of the disease. Phylactos described four types of primary lesions: (a) ulcerative; (b) nodular; (c) papular; (d) lymphogranulomatous urethritis.

The patient rarely gives a history of a small trifling sore which disappears without treatment. After an interval of approximately two weeks, this is followed by a noticeable enlargement of the superficial inguinal lymph glands. The glands are involved by a tardy lymphatic spread from the primary sore. In men, the lymph flow from the penis and scrotum may be impeded, in which case elephantiasis of these parts may follow.<sup>11</sup> As mentioned above, this is in many cases the only manifestation of the disease that draws the patient's attention. A similar oedematous swelling is often seen in lues.

The adenitis may be unilateral or bilateral.

The glands are at first enlarged and discrete, but they soon become matted together on account of the accompanying periadenitis. The skin becomes adherent to the underlying mass of glands. It becomes red, and, later, takes on a violaceous colour. The inflammation extends upwards to the external iliac glands. Areas of softening appear, which break down, giving rise to multiple fistulæ. Pain is usually absent, but tenderness on pressure over the glands is present. In other cases, the inguinal glands may enlarge without suppuration. General symptoms, such as high temperature, fast pulse, chills and arthritis may be present. An enlarged spleen, erythema nodosum, and erythema multiforme have been reported as part of the clinical picture at this stage. A leucocytosis of 10,000 to 20,000, with increase of large mononuclears, is considered to be of diagnostic importance. The French writers mention that the involvement of the deep iliac glands is pathognomonic.

The second stage lasts for weeks or months, the process of glandular inflammation eventually subsiding with repair by fibrosis.

The third stage of the disease is seldom seen in men. When it does occur, it assumes the nature of rectal stricture, the pathology of which will be described later.

*In the female.*—The primary sore occurs at the fourchette and within the vagina, especially the posterior fornix. The primary lesion being often overlooked in men, it is not surprising that it is rarely seen in women. It may assume any one of the four types above mentioned. Even when an inguinal adenitis is present it seldom reaches the stage of suppuration in women. The only common manifestations of the disease in women are the late ones, which appear years after the primary lesion. The most characteristic type is the stricture of the rectum. Other rare clinical forms are as follows: (1) chronic ulcer of genito-anorectal region (esthiomène); (2) elephantiasis of the pudendum; (3) any combination of the above.

Esthiomène, or *ulcus vulvæ chronicum elephantasticum*, is a chronic condition in which there is an ulcer of the vulva associated with elephantiasis. In 1920, Jersild was the first to associate esthiomène as a venereal disease, due to lymphopathia venereum. He was also convinced that Fournier's anorectal syphiloma was identical with Huguier's "esthiomène" and

the "ulcus vulvæ chronicum" of Jodassohn. This was later proved to be so.

It must be mentioned that the lymph drainage from the cervix and upper part of the vaginal wall is to the deeper pelvic and perirectal glands (Gerota). This explains why we seldom see buboes in women. The tendency of the inflammation of the rectal and pelvic glands is to spread to the rectal wall through the lymph vessels, giving rise to inflammation and scar formation with narrowing of the lumen. The immediate result of this is the formation of a rectal stricture. The site of the strictures following lymphogranulomatous infection is usually high in the rectum, just within reach of the end of the index finger. The degree of stenosis, the state of the mucosa, the height of the stricture, vary from patient to patient. The type also varies—it may be annular or tubular.

Sénèque<sup>2</sup> says that there are four forms of stricture caused by lymphogranuloma inguinale: (1) pure stricture limited to the rectum; (2) rectal stricture and elephantiasis of the external parts; (3) rectal stricture complicated with fistulæ and abscesses; (4) rectal stricture complicated with pelvic cellulitis.

#### THE FREI TEST

In 1925 Frei first used the intradermal skin reaction. Pus from a case of lymphogranuloma inguinale that has not fistulized is obtained under aseptic conditions, and is diluted five times with normal saline. It is sterilized at 60° C., for two hours on the first day, and again at the same temperature for one hour on the second day. One-tenth of 1 c.c. of the solution is injected intradermally in the arm. As a control, I also inject 0.1 c.c. of the preserving fluid (0.25 per cent phenol in saline). In 48 hours, there is a marked reaction in positive cases, but only a slight redness at the site of inoculation in negative cases. It must be noted that it is often necessary to use more than one antigen in order to obtain a positive reaction. The antigen loses much of its strength after six months.

Bensaude and Lambling emphasize that the test must not be read before the third or fourth day. The reaction may become increasingly more marked after the 3rd to 4th day and may persist for 8 to 10 days. It persisted four weeks in one patient (Case 1). It is also to be

noted that not every case will give a positive Frei test. In such an event cross-testing is resorted to. An antigen is made from the glandular pus of the suspected case and is injected intradermally into a patient known and proved to have lymphogranuloma. If the latter gives a positive result, it can be taken for granted that the suspected patient is suffering from the disease.

Sulzberger and Wise<sup>5</sup> studied carefully the relationship of the Frei reaction to syphilis. They report cases in which the Wassermann reaction became positive for several weeks as a result of lymphogranuloma infection, and without any evidence of syphilis being demonstrable clinically, in spite of thorough and long continued investigation (Case 2). It is also puzzling why in some patients with lymphogranuloma, who also have syphilitic lesions, one sometimes obtains a negative Frei test reaction and after antiluetic treatment the Frei reaction becomes positive.

#### PATHOLOGY

The etiological factor is unknown. It passes through Berkefeld and Chamberland filters, and is transmitted only by direct contact.

*Pathology of the primary lesion.*—The histological changes have been well described by Favre. At the edge of the lesion the epidermis is thickened, the interpapillary prolongations are wider; the papillæ are thinned or the interdigitations may have entirely disappeared. Where there has been a solution of continuity of the surface the stratum granulosum and stratum lucidum are destroyed. The cavity is surrounded by an altered connective tissue filled with lymphoid cells. The cellular lymphoid infiltration is composed of plasma cells, lymphocytes, swollen connective-tissue cells, and cells with two or more nuclei. Polymorphonuclear leucocytes are also noted.

*Pathology of the glands.*—The lesions here have a characteristic picture. The glands are adherent to one another. On section, multiple abscesses are seen, star-like, and lenticular in shape. DeWolf mentions that the characteristic microscopical picture consists of a specific granulation tissue with areas of necrosis walled off by palisades of epithelial and giant cells.

*Pathology of the rectal stricture.*<sup>12</sup>—The condition is due to an infiltration of the walls of

the rectum. The method by which the inflammation reaches the rectum in women has already been described, so we shall now take up how rectal stricture is formed in men.

According to Jersild, the condition is due to lymph stasis, the blockage taking place in or just proximal to the superficial inguinal glands. Thus the lymph from the penis, arriving at these glands, is directed in a retrograde direction back along lymphatic vessels to the anal canal. The next stage is rectal and peri-rectal infiltration by direct involvement of these tissues by the infective process. Therefore, the essential lesion, for Jersild, is an adenitis of the ano-rectal glands (Gerota).

In the cases where there is no inguinal adenitis, but which have external iliac glandular involvement, we must accept the theory that the glands along the external iliac artery are primarily involved with retrograde invasion towards the deep glands in the meso-rectum, or that there is primary involvement of the glands of Gerota.

*Experimental study.*—A brief summary of the experimental work done is as follows. In 1924 de Bellard successfully transmitted the disease to a monkey by preputial inoculation. In 1930 Helleström reported the successful transmission of the disease to monkeys after intracerebral inoculations. He produced a characteristic meningo-encephalitis in all monkeys, transmitting the disease from one monkey to another. Emulsions of the meninges and the cerebrospinal fluid were used as antigens on patients known to have the disease and all gave a very marked positive result. In 1931, Levaditi, Revault, Lepine and Schoen confirmed the result. Levaditi, Marie and Lepine, after several passages through apes, successfully transmitted the disease by preputial inoculations to human paralytic patients.

A biopsy was taken from a case of ulcerovegetative proctitis. This material was inoculated into a guinea pig. The latter developed a bilateral inguinal adenitis. These ganglionic lesions were then injected into monkeys intracerebrally, developing a typical meningo-encephalitis.

Inoculations have been successful in monkeys, guinea pigs and mice. Extragenital lesions are possible. Helleström reports the case of a doctor who operated on a case of inguinal adenitis and infected his finger. He later developed a

typical auxiliary adenitis which required excision. He also developed a positive Frei test. Ionesco-Michaeli *et al.* have produced a typical peritonitis in 30 monkeys, and also found the appearance of nervous phenomena with pathological changes in the peripheral nerves. The peritonitis is specific and depends on the virulence of the virus.

#### DIFFERENTIAL DIAGNOSIS

The history of one or more transitory lesions on the genitalia, followed by enlargement of the inguinal lymph glands, which in time suppurate, should help one to think of lymphogranuloma inguinale in the male. In the differential diagnosis, we must consider the following:— (1) *Chancroidal bubo*.—The bubo is not a constant accompaniment of chancroid infection but rather a complication. The bubo from chancroid infection is more acute, more painful, suppurates earlier, and produces as a rule but one large fistula. Ducrey's bacillus will be found in the scrapings of the lesion or in the pus from the glands. The Dmelcos (Ito-Reenstierna) intradermal test is considered specific. In lymphogranuloma inguinale the enlargement of the inguinal glands is the dominant sign; these are not painful, and when they suppurate the resulting fistulae are multiple.

2. *Syphilitic adenitis*.—The glands are hard, discrete, and there is no tendency to suppurate. A hard chancre is found on the genitalia. The dark-field examination of the primary lesion or puncture of the gland may reveal the *Spirochaeta pallida*. Repeated Wassermann reactions and the therapeutic test may help.

3. *Tuberculosis*.—Lymphogranulomatous strictures of the rectum were previously thought to be tuberculous, because there were abscesses and fistulous openings in the perianal regions, and also because of the presence of giant cells in the microscopic section of the tissues removed by operation. It is known that the giant cell is not in any way pathognomonic of tuberculosis. Only the presence of Koch's bacilli can prove the case to be tuberculous. Further, animal inoculation has proved that tuberculosis is not the cause of lymphogranuloma inguinale.

4. *Gonorrhœa* was also thought at one time to be the cause of rectal stricture, as gonococci had

been found on the rectal mucosa. There is no evidence to support this. (5) *Hodgkin's disease*; (6) *malignancy*; (7) *typhus fever*; (8) *pestis minor*.

#### TREATMENT

There is at present no known specific treatment, though many various forms have been tried. DeWolf advises potassium iodide orally, combined with antimony and potassium tartrate intravenously, twice weekly, with partial removal of the suppurating glands. Others have suggested repeated puncture of the glands, surgical extirpation, local application of x-rays. Helleström advises vaccine treatment. This has been little used.

Levaditi, Ravaut *et al.* gave urotropin intravenously as a general antiseptic, with injections into the abscesses and fistulae of Lugol's solution, 1 per cent, combined with 20 per cent sodium hyposulphide. As to the local treatment of rectal stricture, it must be admitted that any attempt to dissolve or disperse the scar tissue is doomed to failure. The only efficacious method consists in a free choice of dilatation, incision, or excision, with or without colostomy.

#### CASE 1

S.P., male, aged 34, was referred by Dr. Meindl on February 22, 1932. The patient was sent to me on account of difficulty in defecation, which was attributed to a stricture of the rectum.

*Personal history.*—1916, gonorrhœa; 1917, subacute right inguinal adenitis, with suppuration and formation of 3 or 4 fistulae; 1918, lues (hard chancre).

*Examination.*—On digital examination, a stricture 3 to 4 cm. above the muco-cutaneous line was noted. It would only admit a dilator the size of a lead pencil. There was also a fistula in ano, complete, in the posterior mid line. Some external hæmorrhoids and enlarged papillae were found. A small sigmoidoscope was passed above the stricture and it was noticed that the mucosa there was normal.

I then procured some antigen for the Frei test. This was obtained through the courtesy of Drs. Cole, DeWolf, and Van Cleve. The following results were obtained:

March 17, 1933—The site of inoculation showed some redness at the end of 24 hours. No control was done.

April 5—Frei positive; control negative. (The control consisted of an injection of 0.25 per cent phenol in normal saline).

April 27—Frei positive; control negative. The Wassermann reaction was negative. Urinalysis negative.

This patient happened to accompany his brother-in-law to Rochester, Minn. He was advised to see Dr. Buie there. At the Mayo clinic, the findings were the same as mentioned above. The Frei test was repeated, and it was found to be positive in 33 hours, and remained so for 4 weeks.

#### CASE 2

J.B.L., male, aged 47, was first seen on May 22, 1933. He came to St. Boniface Hospital because he was told elsewhere that he had syphilis.

*Personal history.*—He had been a soldier in the Canadian army, and was discharged in 1919. He never had had any venereal disease. He married while overseas. His wife had been born and raised in a seaport town. They have one child, 13 years of age. His wife developed a recto-vaginal fistula at the time of the confinement, and has never since allowed her husband to have intercourse with her. He denied any extramarital relations. About three weeks before coming to St. Boniface Hospital, he felt something snap in the right groin, when he was carrying a heavy weight upstairs. Subsequently a lump appeared in this region. Two weeks later he was examined by a doctor, and was told to wait for further developments. A week later, on May 16th, a Wassermann test was taken and found to be positive, and he was told that he had syphilis. On coming to St. Boniface Hospital on May 23, 1933, a Wassermann test was found to be negative.

On May 26th, signs of an evanescent sore on the dorsum of the penis were noted. The superficial inguinal lymph glands were enlarged, and some periadenitis was present. On June 3rd, two small ulcers on the mucosa of the prepuce were noticed. They were said to have been there for a few days. Rectal examination revealed an ulcer in the anterior mid line of the anus and internal hæmorrhoids. No other disturbance was noted. A differential blood count was recorded as follows: white blood cells, 8,600; polymorphonuclears, 80 per cent; lymphocytes, 18 per cent; eosinophiles, 2 per cent.

June 5th—Frei test unsatisfactory.

June 10th—Frei test repeated.

June 12th—Test positive.

An inguinal gland from the right groin was removed. The gland was adherent, both to the adjacent glands and to the surrounding tissues.

June 12th—*Pathological report.*—Marble-sized lymph node from the groin. Microscopic histology of a chronic lymphadenitis (granuloma) without any specific cytology.

June 19th—Wassermann reaction doubtful. June 22nd—Wassermann reaction negative. June 24th—Urinalysis negative. No organisms were found in the smear made from the material removed by gland puncture. October, 1933.—Frei test, positive.

*Important points in the above history.*—(1) The Wassermann test showed a transient positive phase, and became negative without treatment. (2) A penile lesion appeared subsequent to the adenitis. (This may have been irrelevant). (3) The antigen used for the Frei test in this case was apparently wholesome, as the same had been used in Case 1. This, it will be remembered, had been confirmed by a positive finding in Rochester. It may be mentioned that the antigen was also tried on cases of non-specific adenitis, various ano-rectal conditions, lues and Hodgkin's disease. In all such trials, it gave negative results.

#### CASE 3

P.B., a male, aged 20, was first seen on June 20, 1933. His chief complaint was a swelling in the inguinal area, which had started four weeks previously as a soft painless mass. It had become progressively larger.

*Personal history.*—There was a history of venereal exposure one month before the enlargement commenced.

*Examination.*—This revealed a mass of enlarged lymph glands in the oblique superficial inguinal group. A few glands were also palpable along the external iliac artery of the same side. The glands were slightly tender, hard, adherent to each other and to the skin. No obvious lesion could be found in the regional lymphatic drainage bed. The Wassermann test was negative.

June 26, 1933—Frei test, positive; control, negative. A smear from gland puncture showed no organisms.

June 27th—Fluctuation developed in one of the glands. The overlying skin becomes adherent and assumed a violent purplish hue. The patient was admitted to hospital.

June 30th—Patient discharged, to continue ambulant treatment. The lesion did not heal completely for about two weeks.

September 8th—Complete resolution, with subsidence of the glandular swellings.

For the antigens necessary in making the foregoing diagnoses, I am indebted to Drs. H. N. Cole, H. F. DeWolfe, and J. V. Van Cleve, and also to Dr. C. E. Corrigan for his interest and valuable cooperation.

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NOTE: A complete bibliography on this subject can be obtained on request from the author.

## THE MANAGEMENT OF THE CARDIAC CASE\*

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THE cardiac case is a therapeutic enigma when the problem is regarded collectively. A large proportion of patients are frequently either too energetically treated or sadly undertreated.

## CLINICAL GRADES

From the standpoint of management it is quite simple to recognize three grades of heart disease, namely, *acute*, *chronic* and *potential*. It is much more difficult at times to establish that the condition is due to primary heart disease than to appraise which form or grade it assumes. For instance, to realize that a heart condition is threatening is more obvious than to estimate that failure is due to peripheral causes such as shock, internal hæmorrhage, or pulmonary embolism. Likewise in the chronic condition, the suggestive feature may be primarily more renal, pulmonary or hæmic than cardiac. So difficult may the situation be that with the best of care an element of error occurs. I recall the case of a very young man who showed an abundance of albuminuria, signs of failing compensation with an enlarged heart, and changes indicating positive myocardial disease, who was at the same time

jaundiced and the liver was definitely palpable. It was later proven that he had Hanot's cirrhosis and was not, as at first regarded, purely cardiac. Likewise a heart may be potentially incompetent and precisely cause the symptom-complex which is regarded as fatigue, exhaustion, debility and decline in old people.

It is consistent therefore to summarize as follows.

1. The acute heart case is one that shows acute failure and the predominance of signs over symptoms.

2. The chronic heart case is the decompensated heart; that is, the patient may be ambulatory or restricted, and show more symptoms than signs, depending on the degree of decompensation.

3. The potential heart case is the heart of incompetence, which in reality shows so very few signs or symptoms expressly cardiac that the interpretation is mainly by inference.

A composite view may be obtained by referring to Table I.

*Acute state.*—The acute state may result from the following situations.

(a) Without warning an acute phase may be precipitated by coronary accidents, rupture of

\* A lecture given before the Moose Jaw Medical Society May 30, 1934.

a myocardial infarct, rupture of a valve, and ventricular fibrillation from any cause, paroxysmal auricular flutter or fibrillation, or the phenomenon of cardiac asthma.

(b) An exacerbation in the course of a chronic condition may result from chronic valvular disease with (x-ray) contour disfiguration; or it may be in a case of chronic myocardial disease with (x-ray) contour disfiguration and alteration in size.

(c) An acute situation may arise, and it is always imminent, in the course of toxic-infectious

TABLE I

ACUTE	
<i>Cardiac Failure</i>	
	Cyanosis
	Venous engorgement
(SIGNS)	Failing pulse
	Anuria
	Edema
<i>Treatment.</i> —Full digitalization.	
CHRONIC	
<i>Cardiac Decompensation</i>	
	Dyspnoea
	Orthopnoea
	Cough
(SYMPTOMS)	Palpitation
	Weakness
	Vertigo
	Angina simplex
<i>Treatment.</i> —Partial — therapeutic — digitalization.	
POTENTIAL	
<i>Cardiac Incompetence</i>	
	Exercise tolerance
(INFERENCE)	Slow pulse recovery
	Fatigue syndrome
	Decline, "senile"
<i>Treatment.</i> —Tonic — supportive — digitalization.	

tious states such as occur in the course of rheumatic fever, pneumonia, pericarditis, diphtheria, and acute thyrotoxicosis.

To recognize the acute condition one is guided of course by manifestations of acute congestive failure. Cyanosis, passive congestion, oedema, and failing pulse are the cardinal signs. Dyspnoea, pulmonary and cerebral embarrassment, and sometimes characteristic pains, or arrhythmias, are added features. It is important to restate that anæsthetic accidents, surgical shock, hæmorrhages of all types, and syncopes from other causes, usually vasomotor in origin, are not to be considered in this category. The circulatory failures in the latter instances are peripheral rather than central or cardiac in origin.

*Chronic state.*—Chronic heart cases are particularly important to us in this consideration. These cases constitute by far the largest group with which we are continually in contact. In this class come cases that have already experienced an acute phase, perhaps more than once, and also those which have had a gradual onset and are progressive. A large proportion are ambulatory. Some are restricted in their capacity for work, while others are strictly confined as terminal conditions, or are temporarily and periodically embarrassed because of aggravated states in the course of their existence. The numbers in this group are derived from two main causative factors, namely:—

1. The toxic-infectious carditis.—Chronic valvular disease may be found alone or associated with myocardial and, not infrequently, pericardial involvement in rheumatic fever, focal infection, and syphilitic disease. Diphtheria and the thyrotoxic heart showing signs of broken-down compensation are common examples of the toxic factor.

2. Degenerative carditis.—The heart in hypertension is the commonest example, and similar results are evident in arteriosclerosis, nephritis, chronic prostatism, etc. When an organic murmur exists, which implies a pathological change, it is yet debatable whether chronic heart disease may be diagnosed. It is interesting to note that in application for insurance companies interpret it as such. Figures on an actuarial basis obtained from a reputable life insurance firm support this interpretation.<sup>3</sup> It should be understood that one is going to treat the heart not on the basis of an organic murmur but rather on the basis of its capacity to do work, or at least on whether the patient's indisposition is the result of those features which are the components of the chronic heart picture. So that a murmur, an enlargement of the heart, or a minor arrhythmia do not individually form a sufficient basis for energetic therapeutic endeavours.

Recognition of a chronic pathological change in the anatomy or physiology is obviously important. It is insufficient reason, for instance, to interpret the chronic headache in such a patient unless a state of cardiac decompensation is also present. The permanent anatomically damaged heart alone, without corresponding

evidence of decompensation, should be treated very much as the lawyer who keeps a "watching brief" on a case in court. Too often it is made accountable for complaints due to other causes. Decompensations vary in degree, from the case that is ambulatory to the case that is slowly but progressively becoming bed-ridden. The chronic state, within our meaning, shows cardiac decompensation. With the exception of the aggravated state, symptoms predominate. The complaints are dyspnoea, orthopnoea, cough, palpitation, weakness, vertigo, anuria, sometimes angina simplex. Then on examination one will find heart disease with signs of passive congestion, and even oedema and a limited exercise tolerance.

*Potential state.*—To determine exactly what is implied in this clinical concept is not easy.

There is here a paucity in both signs and symptoms that might ordinarily serve one in diagnostic or therapeutic guidance. One should be on guard when a history is obtained of paroxysmal tachycardia in cases that, when examined in the interval, show absolutely no heart disease. At the same time some indications may be found, other causes excluded, such as exercise tolerance, or that the heart rate is slow to recover after exertion and that fatigue is often associated with an angina simplex. Here more than elsewhere the low voltage electrocardiogram has its proper relation. The senile heart, which in the ordinary sense is not a pathological entity, is commonly a candidate for this category. In obesity there is not necessarily present a fatty infiltration of the heart, while dyspnoea may be a prelude of long-standing. Myxoedema will show characteristic cardiac changes when sufficiently advanced, and the complaints which arise are not always due to the lowered basal metabolism but also to some degree of cardiac incompetence.

#### TREATMENT

*In the acute state.*—When the patient is first seen at home or on admission to the hospital the anxiety which is not so much of fear as of actual distress, is most striking. Before objective and enduring treatment can be administered a sedative dose of morphine hypodermically is desirable. Except where the diagnosis is in question there are very few instances that contraindicate

this routine. Our practice is to eliminate the usual combination with atropine, because in the sensitive individual the secretions are dried, the cardio-inhibitory mechanism is further depressed, and the heart rate accelerated; the acute pulmonary congestions are not improved. Mucus is very tenacious and thick, and it would appear more logical to give a potent expectorant in preference. More recently in such embarrassed situations bronchoscopic aspiration has proved a justifiable means in trained hands. The conjecture is that the widespread use of strychnine under the guise of a cardiac stimulant is due to its salutary influence on the bronchial secretions.

With this clinical picture in mind the next step frequently called for is an immediate stimulant. In those cases not previously studied it is heroic for this purpose to give the most potent and genuinely recognized cardiac-specific drug, namely, strophanthin or ouabain intravenously. In the preferred list may be mentioned metrazol, caffeine sodium benzoate, camphor in oil, coramin and adrenalin. The efficacy of these drugs depends more on what they can achieve indirectly than the amount of their direct cardiac stimulating properties. Rise in blood pressure is mainly a peripheral effect, diuresis is as much due to renal stimulation, the respiratory results are central, and what other benefits remain are probably cardiac. Of this group some favour more one or other of the accessory faculties enumerated, but they certainly have not all the same properties to the same degree. Practically, adrenalin is the most transitory in its effect, and caffeine sodium benzoate is probably the more prolonged.

It is out of place to review the pharmacological action of each. Suffice it to say that they can be recommended on the basis of personal experience. As an emergency measure, where maintenance is not counted on, when respiratory stimulation and incidental pulmonary ventilation is called for, the pulse will be demonstrably improved in a failing heart. A sustaining effect should not be expected. That can only be obtained by the use of drugs to be discussed later. Not uncommonly, the use of these drugs is discredited, because it is deferred to a place of last resort, and then a desperate attempt is made to keep a failing heart going in a terminal state, as, for example, in pneu-

monia. Whereas if employed on the recognition of imminent heart failure some good may be expected.

Since cyanosis is a cardinal feature in most cases the use of oxygen when available is certainly a supportive measure. The small head tent will be found intolerable by a restless patient. Likewise, but perhaps less so, is the intranasal catheter. Although it produces an enormous waste of oxygen the funnel method is productive of results. A guide to the effectiveness is both the improvement in colour and the lowering of the pulse rate. In the country and when oxygen is not available the open window or an electric fan, with the patient so arranged as to be in the air current, but not against it, should not be overlooked. The use of intravenous glucose is an adjunct in the treatment of the acute stage. It cannot be advocated as a means to an end, although it has been shown that with rest alone and concentrated glucose only cases will recover from an acute phase (Falta). Those who favour the use of glucose will give concentrated solutions in small quantities, such as 20 c.c. of a 20 per cent solution.

Enduring objective treatment is limited almost entirely to the use of digitalis and allied products. This is the universally accepted cardiac-specific drug. The scheme for digitalization involves a few generalities. First, in regard to the preparations; the plan is quite simple if it is appreciated that the whole host of market products comprises three main divisions, namely, whole drug products; active principles; related or digitalis-like principles. The method of administration is a matter of choice, because the three groups can be given by mouth, intravenously, or rectally, when suitably prepared. The form of preparation makes no difference, whether as powder, hypodermic solution, or infusion, so long as accurate standardization is maintained.

When digitalis medication is decided upon there must be an objective in mind.<sup>1</sup> One of three desired effects is possible: (1) full digitalization; (2) partial (therapeutic) digitalization; (3) supportive (tonic) digitalization. Full digitalization is attained by giving 0.15 cat units or its equivalent per pound of body weight (0.15 cat units equals  $2\frac{1}{4}$  min. of the tincture, equals  $\frac{1}{4}$  [9/40th] grain of powdered leaf, equals 1.5 c.c. of infusion). Slightly better than one-half of this amount is needed for therapeutic effect.

Knowledge of the maintenance requirements, which is 21 minims for twenty-four hours, is sufficient guidance in prescribing the supportive or tonic requirements. The length of time that one takes in administering the calculated dose is a matter of personal experience. Rapid and large doses should be reserved for the most urgent cases. Before leaving the matter of digitalization, even as sketchily as it has been gone into here, one should point out that to keep a record of the amount of digitalis used in whatever form is very helpful in every case.

The state of acute congestion implies stasis and faulty elimination. By effective digitalization the problem is automatically solved. However it facilitates matters, particularly in the case of an acute exacerbation of a chronic state when oedema is most marked, to further assist diuresis. Utilizing the more recent mercurial preparations is excellent practice. Concomitant intravenous salyrgan and 120 grains of ammonium chloride by mouth in twenty-four hours increase elimination and reduce the burden on the heart.

Drugs alone do not solve the problem of the acutely failing heart, unless one thinks only of the heart and not of the patient. It is extremely important that the patient be made as comfortable as possible. Rest can only come with comfort, and posture plays a large part in that. For the first twenty-four hours the diet is a negligible consideration. The patient should be given from 500 to 1,500 c.c. of tasty sweetened drinks, for their carbohydrate value. Total fluid intake is usually restricted during the whole course of the immediate breakdown. This is best regulated by the quantity of output. A record of both can be conveniently kept even by untrained attendants. Subsequently a low residue, high carbohydrate, diet should be prescribed, with meals evenly divided three or four times a day. Salt should be eliminated at first and carefully regulated later. Suitable substitutes are available. During the course of stay in bed massage to the extremities should be carried out daily. The benefit is obvious, and, where a patient remains confined over a long period of time, it is conceivable as a means of preventing venous thrombosis and perhaps a death from pulmonary embolism just at the time when the good work is completed and the patient first sits up.

Before finally discharging the patient maintenance medication should not be neglected, especially if digitalis is relied on. Instructions for periodic examination in permanently damaged hearts should be given. Then only will the sin of omission not be ours, and the sin of commission the patient's if he fails us.

*In the chronic state.*—The chronic heart conditions that need treatment fall into two main categories. These are wholly dependent on the degree of decompensation. If an early or moderate case the patient is ambulatory, and if worse he must be confined. An extremely large proportion belong to the invalid ambulatory class. If it can be said, disparagingly, that the acute case suffers from overtreatment it is this group that is neglected most. Such factors as duration of disability, cost of visit to the doctor, bad neighbourly advice, and the element of frustrated hope are brought to account. It is surprising how long the worst type of cardiac enlargement can be made endurable, and even more so the uncomplicated valvular disease for which nothing more than precaution is preached. Active treatment amounts to a proper estimation of the amount of cardiac impairment, including the capacity for doing work, or, conversely, the amount of decompensation. It is paramount to estimate accurately actual disease for more than obvious reasons. When one sees large numbers that belong to this group, it is commonly observed that erring on the part of safety in the matter of advice creates phobias and obsessions that are greater deterrents to the patient's well-being than what follows on minor impairments. It follows, then, that we should approximate the expenditure to the means, in other words, place limitations for exertion or work on the favourable side of the threshold in the circulatory scheme. In importance there is a reversal of the order in dealing with the acute and the chronic stages. Rest, and not drugs, comes first in the latter. Since work is so integral a part of the economics in the adult more thought should be devoted to the young adolescent victim, especially in relation to the choice of a suitable vocation. The choice becomes a matter of physical capacity versus ambition, inclination or opportunity. In this respect there is no difference in comparison with other types of invalids or cripples, except that longevity is

imperilled. In dealing with rest emphasis must therefore be placed equally on appropriate occupation as well as recreation.

Under this same caption comes the thought in regard to the patient's prospects. Prognosis is more difficult than diagnosis. Very few have not experienced in a lifetime the triumph of motherhood in a condemned patient with mitral stenosis with a goodly span of years to her credit. It is admittedly the rare exception and not the common rule that is pointed out. It serves, however, the purpose to say only that one should give courage to these afflicted rather than continually harp on their incapacities.

Having discussed freely details covering the activities of the individual, the need for medicinal treatment is considered. There are three purposeful designs. Does the myocardium need reinforcement? Does the existing rhythm need stabilizing? What peripheral barriers exist, and in what way can they be relieved? It is possible that all three problems exist at the same time and often all are taken care of by one manoeuvre. For instance, in particularly suitable cases digitalis will reinforce the heart, correct fibrillation, and stimulate diuresis. The barbiturates or nitrites can influence a threatening hypertensive state and relieve an embarrassed myocardium without need for direct reinforcement. Many combinations of the designs set down can by various therapeutic managements be achieved. It is more satisfactory not to have to aim as with a three-barrelled pistol and write cumbersome recipes, because of cost, cooperation, and the extended period covering treatment.

For reinforcement of the myocardium the digitalis group comes first. Quinine, caffeine, and, by some, calcium, are also used, with the specificity lessened in the order mentioned. Such treatment should be instituted to overcome decompensation. Full digitalization is not required. The therapeutic effect is sufficiently achieved when half the full amount is reached. Following this a daily maintenance of 20 minims of a standardized tincture of digitalis or its equivalent can be conveniently given in a single dose once a day. It is interesting to note how often patients learn their own tolerance and manage to regulate the required dose. Quinine may be combined with the powdered leaf of digitalis, and likewise caffeine, or used alone. The rationale of quinine therapy is based on the

fact that the refractory period is prolonged in auricular muscles, and generally metabolic activity is reduced. The alkaloid quinidine is reserved for auricular fibrillation when digitalis has failed. Quinidine needs to be thought of only when the question of stabilizing rhythm is desirable. If it were possible to correct all arrhythmias it would be in order of first importance to persevere to this end. Unfortunately, not many arrhythmias can be fully restored, and fewer still can be maintained correctly. So that, for the most part, if a reduction in the ventricular rate is successfully attained and the pulse deficit minimized it becomes quite sufficient in itself after due trial without obtaining better results. The only useful drugs for stabilizing arrhythmias are digitalis and quinidine. For the lesser forms eliminations of infected foci and toxic substances is usually sufficient.

Final advice is regarding diet. This should be restricted only as to quantity and heavy meals too soon before bed time. Flatulency must be avoided. Overweight is a drawback. The protein restriction applies only to cases of proven or suspected nitrogenous retention products. Fluid intake is regulated by noting the weight curve of the individual and the amount of elimination. We have seen the prolonged routine salt-free diet produce an alkalosis with apnoea easily mistaken for dyspnoea.

*In the potential state.*—Assuming that it is practical to consider the potential class a clinical entity, the only danger lies in overestimating the incidence. The possibility should be thought of in the presence of certain existing conditions, especially where indications suggest incompetence. Some examples will illustrate the point. A simple cardiac enlargement or a valvular lesion alone, as against any discernible myocardial defects, are conceivable grounds for a symptomatology, particularly in the presence of reduced exercise tolerance. Obesity has already been referred to, and mention was made of hypothyroidism. It is added in explanation that the primary cause is the first principle in treatment, and usually sufficient in itself. One cannot help feel, when seeing those people who suffer from paroxysms of the various tachycardias with perfectly normal intervals, that these are rather serious omens when the whole life plan of the in-

dividual is considered. Certainly, the various hearts with congenital abnormalities that do not show decompensation are at their best never really efficient. In the course of hypertensive disease, before the heart is enlarged, evidence of insufficiency will appear. These are the precursors in a positive series of events. The plea in relation to the ageing process in the myocardium, as set forth by Christian,<sup>2</sup> and in other presumed antecedents of myocardial hypertrophy is founded on practical reasons, supported experimentally on animals by Cloetta. Treatment will be beneficial, and, as believed by some, cardiac developments will be actually retarded by the use of digitalis.

The management of the situations pointed out above cannot be classical. While indications for treatment may exist, direct means for producing results are lacking. For those with the better prospects digitalis is valuable. The controversy only is in relation to the dosage. This brings in the concept denied by many, namely, the supportive or tonic effects. Support of the empiric use is to be found amongst a majority of general physicians, and encouragement comes from no less an authority than Wenckebach.<sup>4</sup> On a rational basis it is possible to explain that in the cases benefiting by less than the maintenance daily dose of digitalis the individual's susceptibility factor is accountable. In others receiving slightly more than what is allowed for the amount eliminated daily, results are attributable to the cumulative properties of the drug.

#### CONCLUSION

It was conceived possible at the start to visualize the whole subject matter—the cardiac case—in a general way. In conclusion and in support thereof it can be said that specific clinical entities such as endocarditis lenta, angina verum and the like, are not excluded from the scheme as a whole, if at any time in their course such features as govern the three main grades discussed herein predominate.

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## RECTAL HÆMORRHAGE

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LOSS of blood from the rectum must be regarded as a sign of serious import, necessitating a careful study of the history of the patient and a thorough examination. It may range from a slight loss without any disturbance of health to the other extreme where the bleeding may be copious or persistent enough to produce marked secondary anæmia.

Rectal hæmorrhage is unlike bleeding from any of the other orifices of the body, because of the anatomical arrangement of the anal outlet. The external sphincter muscle assisted by the circular muscle fibres of the lower rectum (the internal sphincter of the ano-rectum) and the *lévatores ani*, guard the anal outlet. The manner of the blood loss will depend therefore upon the degree of muscle tone of the sphincter area, and it is therefore obvious that when sphincter tone is unimpaired bleeding, unless copious enough to initiate the desire for defæcation, will be concomitant with bowel evacuations. Under certain abnormal conditions this normal sphincter tone is overcome and the muscles guarding the anal outlet are relaxed. One now observes loss of blood both during bowel evacuation and at irregular intervals. We are not concerned here with the dark pitchy grumous stools stained with blood pigments or altered blood found in cases of peptic ulcer, Meckel's diverticulum or other ulcerative lesions high up in the intestinal tract more than is necessary to effect a diagnosis, but rather with that group of cases which present frank rectal bleeding, either between, during, or after bowel evacuations.

It is not sufficiently recognized that rectal bleeding, even though this be small in amount, may be long continued or persistent enough to produce a marked secondary anæmia. Patients may be seen with marked pallor of the skin and blanching of the mucous membranes who upon examination reveal a marked anæmia of the secondary type, in whom one elicits a history of persistent blood loss per rectum. Curiously, it is often observed that this bleeding has not been excessive in amount. Such a picture often

proves misleading and the examiner may be led into the belief that the anæmia is of the primary type. On the other hand one often sees patients with marked secondary anæmia who give no history of loss of blood per rectum, and where one might search fruitlessly for a bleeding lesion in some part of the body. It must be recognized that concealed rectal bleeding does exist in some cases, occurring either before or after bowel evacuations, and although part of this blood may be expelled in an altered clotted state with the bowel evacuation the patient may be unaware of its presence. There is no doubt that such cases have been at times erroneously labeled as bleeding peptic ulcers. The blood loss with its resultant anæmia has produced dyspeptic symptoms, and even on a meat-free diet such patients will have stools with a strongly positive benzidine reaction. The x-ray findings of the pyloric area might also be suggestive because of spasm which one might see in this area as the result of the disturbed state of the patient's health. A therapeutic test, to determine whether the source of blood loss is from the hæmorrhoidal area, will be outlined under differential diagnosis.

The investigation of a rectal case calls for the use of very few instruments. One requires a comfortably fitting rubber glove with a suitable lubricant, a proctoscope, and a sigmoidoscope. The physician should acquaint himself with the use of these instruments, and it will not be difficult to establish an ano-rectal diagnosis.<sup>1</sup>

## ETIOLOGY OF RECTAL HÆMORRHAGE

*Internal hæmorrhoids* account for rectal bleeding in the majority of cases. The columns of Morgagni of the lower rectum, which end below at the pectinate line, contain the terminations of the superior hæmorrhoidal artery and vein. There is a rather free anastomosis on the surface of the rectum between the superior hæmorrhoidal vein (which drains into the portal circulation) and between the middle hæmorrhoidal and middle sacral veins, (which

drain into the general circulation through the hypogastric tributaries of the inferior vena cava). It is the enlargement chiefly of the radicals of the superior hæmorrhoidal vein forming varicose tumours, and causing a redundancy of the mucous membrane which covers and overlies them, that constitutes internal piles. This enlargement is at first soft, vascular, and later fibrous. The condition may lead to hæmorrhage and prolapse or thrombosis and ulceration.

The muscular and elastic coats of the dilated vein walls lie very near the surface and are soon replaced to a varying degree by fibrous tissue. (The internal or superior hæmorrhoidal plexus runs in the submucosa quite superficially and is the plexus primarily involved in forming hæmorrhoidal varices. This plexus empties into the portal circulation). There is an actual thinning of the vessel wall. A hæmorrhoid of long-standing therefore presents a thin dilated wall, which lies immediately beneath the mucosa and is very vulnerable and prone to ulceration and rupture. The overlying mucosa is more or less diseased, thickened and granular, and affords very little protection to the underlying varicosities. Bleeding is the result of fæcal trauma, ulceration through from the mucosa, or the grasping of the varix by a tight external sphincter muscle, causing a pin-point rupture of the dilated vein wall.

There are two types of internal hæmorrhoidal lesions which will cause at one time or another some degree of rectal bleeding. These are differentiated only by proctoscopy; and moreover unless they are prolapsed outside the sphincter one cannot make a diagnosis of internal hæmorrhoids. The first type consists of a large redundant hæmorrhoidal ring, which upon proctoscopy is found chiefly in the anterior and right lateral quadrants of the rectum. The three primary hæmorrhoids following the distribution of the superior hæmorrhoidal vessels are a left lateral, a right anterior and a right posterior. In the knee-elbow position the redundant vascular mucosa of the right anterior and left lateral hæmorrhoids prolapse by gravity into the anterior rectal quadrant, and almost like a concertina crowd into this area. This first type shows a granular oedematous redundant mucosa overlying the hæmorrhoidal varices. Even in patients who have been bleed-

ing freely with the bowel evacuations *one cannot but rarely demonstrate a source of bleeding during proctoscopy*. The redundant mucosa overrides the pin-point ulceration and moves freely over the underlying vascular varices.

The mucous membrane of the rectum is normally very loosely attached in a redundant manner to the submucosa by fibrous and elastic tissue, and tends to ride freely over the submucosa. This arrangement offers but a feeble support to the veins of the lower rectum which are quite superficial in the submucosa, and very little resistance is offered to a dilated state in these vessels. This fact can be demonstrated by injecting any fluid submucosally, and it can be seen how easily the fluid flows and floats the mucosa off from its bed (as in the submucous injection treatment for hæmorrhoids to be discussed). This anatomical arrangement of superficial veins and loosely attached redundant mucous membrane of the rectum found normally, together with the fact that the portal vein and its larger tributaries are without valves, are factors which easily favour the development of rectal varices.

The second type of hæmorrhoidal bleeding is quite different and distinctive from the first. In this type one does not see in the lower rectum upon proctoscopy the large redundant vascular mucosa overlying the hæmorrhoidal varix, but just above the pectinate line, *i.e.*, just at the base of the columns of Morgagni, there is a congestive bluish purple highly vascular ring, which bleeds easily to the touch. This type of bleeding hæmorrhoidal ring is more often observed in younger athletic individuals. There is very little redundant mucosa or large dilated varices higher up in the rectum as found in the first type. It is very important to differentiate between the two types in order to control the bleeding. This will be discussed under treatment.

The development of a marked secondary anæmia, with a low colour index, is a peculiar complication which occurs in a small percentage of patients suffering from bleeding hæmorrhoids. This complication is peculiar in that the volume of the loss of blood in many such patients does not appear to be considerable. Yet many patients are observed who bleed freely from large rectal varices, and who do not show any or at the most only very slight alterations

in their blood picture. There can be no doubt that the former class, for certain reasons, must lack the ability to replace the blood loss in an adequate or expedient manner. Moreover, as has already been mentioned, concealed rectal bleeding of considerable degree into the rectal ampulla can be demonstrated by proctoscopy in certain patients. The factors operative in producing a severe anæmia in a small group of cases of bleeding hæmorrhoids are obviously adequately coped with in the majority of patients, but nevertheless one should ever be mindful of a possible rectal lesion in any case of marked anæmia where the cause appears obscure. One might not elicit a history of rectal bleeding or the statement might be casually made of an occasional blood loss with stool.

*Fissura in ano* is a common lesion which will from time to time result in free rectal bleeding in which the stool is blood-streaked in character. The location of the fissure is usually dorsal in the lower anus, below the pectinate line, but it is sometimes found anteriorly. Severe rectal pain (because of the rich sensory nerve supply of the anus with cerebrospinal nerves) and bleeding at stool are characteristic findings in this lesion. In the later stages of evolution of this lesion a marked degree of anal stenosis is usually found, the result of spasm and fibrosis of the external sphincter muscle and its surrounding tissues; together with an anal ulcer which is quite indurated. A chronic anal fissure may result in an occasional attack of brisk bleeding, whereas the acute fissure will usually cause some degree of blood loss with practically every bowel evacuation. Chronic anal fissure must be differentiated from anal epithelioma, primary sore, and tuberculous ulceration of the anus, which lesions also cause rectal pain and bleeding.<sup>1</sup>

*Stenosis of the anus* is a not uncommon condition which frequently goes unrecognized, and which may be the source of pain and rectal bleeding. Narrowing of the anus is the result of pathological changes in the anal canal resulting in a condition of fibrosis of the external sphincter muscle, chiefly in the pecten region (which extends from the base of the columns of Morgagni to the white line of Hilton, *i.e.*, the middle third of the anus), and results in the formation of a hard band of fibrous tissue, first described by Miles and named the "pecten

band". Abel,<sup>2</sup> who amplified Miles' observations, refers to this condition as "pectenosis". Any condition which produces passive congestion in the ano-rectum, such as hæmorrhoidal varices, the long continued ingestion of saline purgatives, infection of the crypts of Morgagni, or fissure (Abel regards fissure as secondary to pectenosis) will initiate inflammatory fibrotic changes in the anal canal in the sub-mucosa of the pecten region, and will ultimately produce marked narrowing of the anal outlet. Large bulky stools will cause tears in the anal canal which bleed freely. These patients soon learn to liquefy their stools with salines or large doses of liquid paraffin and thus establish a vicious circle. A tight uncomfortable anus which offers resistance to simple digital examination must therefore be suspected as a source of rectal bleeding in certain patients.

*Fæcal impaction* is a condition which must not be forgotten as a possible source of rectal bleeding. It may easily be overlooked and may be present in an incomplete form for many months without its presence being suspected. The most common sites for this are in the ampulla of the rectum and the sigmoid. It is in the sigmoid and descending colon where the greatest absorption of water occurs, and it is no doubt due to this factor that the terminal point in the large bowel will usually be the site of this abnormality. Gravity and the resistance offered at the recto-sigmoid junction must be other factors in rendering this a selective site for impaction. The patient may have what he believes to be normal bowel evacuations. Liquid or semi-formed stools are forced past alongside and around the obstructing fæcal column; more rarely will canalization occur through the mass. Pelvic pain and pressure are usually present. In the badly obstructed case there may be a constant desire to go to stool, especially on standing, which the liquid or semi-liquid evacuation does not relieve. The advancing hard fæcal column, with its head obstructed either at the recto-sigmoid or rarely at the ano-rectal junction, due to forcible peristalsis, produces considerable trauma to the mucosa of the bowel and, when low down, to the very vascular hæmorrhoidal area. Free bleeding may occur. Carcinoma may be wrongly diagnosed by the history, and the hard scybalous nature of the mass may lead the in-

experienced into diagnosing a neoplasm. Where a rectal examination is not performed the severe pain and bleeding induced by low impactions may lead one to believe that a fissure is present.

The benign tumours of epithelial origin, the *adenomata* and *papillomata*, may cause free rectal bleeding. Proctoscopy and sigmoidoscopy will reveal these. They are frequent precursors of rectal and sigmoidal cancer. Familial polyposis intestini (multiple familial adenomatosis) is an uncommon cause of rectal hæmorrhage, and causes a rapidly developing anæmia. This lesion develops in the "teens" and "twenties", and there is always a strongly positive family history of either this condition or rectal and colon cancer. This unfortunate disease is regarded by some as hereditary.

*Rectal cancer* causes bleeding only when the lesion is well established and when central ulceration of the growth in the later stages of its evolution has occurred. Bleeding *per rectum* cannot be regarded as an early sign in rectal malignancy, but certainly occurs as a troublesome symptom in the later stages of the disease.

*Acute catarrhal* and *acute hæmorrhagic proctitis* produce tenesmus and rectal bleeding. Infection, trauma, drugs and diet (spoiled fish or shell fish) are causative factors. Usually there is sigmoidal and large bowel involvement, but a simple proctitis may exist without involvement of the colon. Proctoscopy will demonstrate the lesion. The mucosa is hyperæmic, œdematous, granular, and exudes muco-pus and blood. In the acute hæmorrhagic type, free bleeding into the lumen of the proctoscope obscures the field.

The various *ulcerative lesions of the colon* will produce rectal bleeding, with or without diarrhœa and tenesmus. Chronic ulcerative colitis and amœbic entero-colitis are frequently seen in this country. Amœbic entero-colitis has been observed to commence acutely without diarrhœa, with abdominal cramps, vomiting, and right lower quadrant abdominal pain. The patient may have noticed nothing unusual about the stools. In this type the mucosa of the cæcum and ascending colon is acutely inflamed. Proctoscopy in this type of case will always establish the diagnosis, since when the cæcum is involved early the mucous membrane of the sigmoid will usually reveal œdema, granulation,

hyperæmia, a muco-purulent bloody exudate and early ulceration. Such cases, because of the acute onset in an obviously healthy person, may be operated upon for acute appendicitis with disastrous results. Bacillary dysentery and tuberculosis of the colon cause rectal bleeding; in the latter when the lesion is high the stools may be grumous black and intimately mixed with the altered blood.

*Colo-proctitis* of a hæmorrhagic type may be found in certain severe constitutional and infectious states, and is usually discovered at autopsy. In these conditions the general picture renders the diagnosis simple. One may observe severe hæmorrhagic colo-proctitis in uræmia, fulminant cases of diabetes mellitus, typhoid, septicæmia, puerperal sepsis, severe marasmus, and certain types of avitaminosis. Portal obstruction, tricuspid insufficiency and cardiac decompensation produce passive congestion in the portal venous system. Hæmorrhoidal varices and free rectal bleeding may be observed. *Stricture of the rectum and pelvic colon*, whether these be congenital, traumatic or inflammatory, produces ulceration and infection of the mucosa above the lesion, and rectal bleeding occurs as one of the symptoms.

*Foreign bodies* and *trauma* to the rectum and sigmoid will produce rectal bleeding as part of the clinical picture. An appropriate history and careful examination will establish the diagnosis.

#### DIFFERENTIAL DIAGNOSIS

Since rectal bleeding may be due to one of various lesions it necessarily follows that one must take a careful history and perform a thorough examination. The ano-rectum and sigmoid must be thoroughly investigated by proctoscopy and sigmoidoscopy. This investigation should be supplemented by a complete general examination, and, when indicated, by a barium series and barium enema.

Internal hæmorrhoids are the commonest source of rectal bleeding. This lesion may however coexist with other local lesions of the terminal bowel, such as adenomata, papillomata, carcinoma, fissure or colo-proctitis. Systemic disturbances, especially portal obstruction as in cirrhosis of the liver, tricuspid insufficiency, abdominal or pelvic tumours, uterine displacements, pregnancy, pelvic inflammatory disease, and prostatism, might all produce hæmorrhoidal

varices. One must therefore never diagnose hæmorrhoids as an abnormal physiological state *per se*, unless a possible primary contributory cause can be ruled out.<sup>3</sup>

A puzzling situation might present itself when a patient with a vascular bleeding hæmorrhoidal ring, presents suggestive signs and symptoms of peptic ulcer. There might be a secondary anæmia and the gastric or duodenal picture might not be convincingly clear, either because of an indefinite history or doubtful roentgenographic findings. The administration of one or two submucous injections of 5 per cent carbolic acid in sweet almond oil, distributed high up in 5 to 10 c.c. doses, beginning above the hæmorrhoidal area and distributing the solution down to the base of the hæmorrhoidal varices, practically always arrests the bleeding from the hæmorrhoidal area. If after several days the stool yields a positive benzidine reaction and the blood loss *per rectum* persists then the hæmorrhoidal varices can be certainly ruled out as the important source of bleeding.

#### TREATMENT

Appropriate medical and surgical measures will be instituted in the lesions outlined, and one need stress only one or two points here. It is unsafe and unwise to perform hæmorrhoidectomy in a patient with bleeding piles, who shows a marked secondary anæmia. The patient is in a poor state for operative interference, and one might invite complications. The administration of one or two submucous injections of 5 per cent phenol in sweet almond oil will control even the severest type of hæmorrhoidal hæmorrhage. If the case is suitable for the subsequent non-operative treatment of the hæmorrhoidal dilatations, then this method of treatment can be persevered with at weekly intervals, not only to arrest the bleeding but to cure the disturbance.

In the second type of the congestive vascular non-redundant hæmorrhoidal ring, described as found in younger patients, the submucous injection must be placed into and just above this ring of vascularity in order to control the bleeding. A liberal diet, rich in iron, should be ordered, supplemented with either the iron and ammonium citrate or one of the Blaud and

copper preparations. The patient is thus immediately put on the road to recovery, as contrasted with surgical interference at a time when his forces of resistance and immunity are depleted. Moreover, with the former conservative method of treatment, if the patient is not too ill, he may be up and around. If necessary surgical ablation of the hæmorrhoidal varices can be later performed under more favourable circumstances. This method of arresting rectal hæmorrhage might be safely and advantageously employed in those cases of portal cirrhosis which at times show an alarming degree of blood loss from the hæmorrhoidal area. Quite naturally mild blood loss in these cases might be desirable, but the hæmorrhage from a ruptured varix can thus be controlled without subjecting the patient to operation. This method of treatment produces submucous induration which surrounds the superior hæmorrhoidal veins and their bleeding points and compresses them. Hæmorrhage is thus controlled. If the injections are continued at intervals the redundant mucosa is pulled up and the hæmorrhoidal varices are obliterated.

Since adenomata and papillomata are frequent precursors of cancer, early fulguration of these lesions through a proctoscope or sigmoidoscope should be practised. These patients must be kept under observation for years.

#### SUMMARY AND CONCLUSIONS

The discovery of the source of rectal bleeding necessitates much painstaking effort, since its cause and etiology may be either in the terminal bowel or at a distance.

One or more lesions may be responsible for blood loss *per rectum*.

Careful exercise of judgment in dealing with rectal hæmorrhage is essential.

Acute amœbic entero-colitis, in which lesion the loss of blood from the bowel may not be apparent, may simulate acute appendicitis.

Conservative treatment in cases of bleeding hæmorrhoids with anæmia is outlined.

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## THE CLINICAL USE OF STAPHYLOCOCCIC TOXOID

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IN our last paper<sup>1</sup> we pointed out that we were dealing with a staphylococcic factor in all our diabetics in this region, that this was present in most cases in the upper respiratory tract, and that it could be treated effectively with staphylococcic toxoid. During the course of this investigation, some 100 non-diabetics suffering from sinus infections came seeking help. From our observations during the last two winters we feel that staphylococcic infection is frequently present in sinuses throughout the Great Lakes region, and that the toxæmia from this infection is giving a variety of symptoms elsewhere in the body, but few local signs or symptoms in the upper respiratory tract.

Several patients whose clinical picture for years suggested this infection, with symptoms of tachycardia, marked anæmia and fatigue, and who on culture showed only *Pneumococcus*, *Streptococcus viridans* and other organisms found in the upper respiratory tract, were given toxoid in the absence of positive cultures. These showed the greatest improvement on this treatment that they had done for years. Later, with more acid culture media, these have all shown the presence of staphylococcus.

The large percentage of positive cultures in our practice may be due to two reasons, and only further work will definitely prove whether this high percentage is normally present in the population of this region. As pointed out,<sup>1</sup> we have been doing this work during a period in which the humidity has been abnormally high for two years, and therefore the worst for sinus infections for many years.<sup>6</sup> This type of case usually improves from May to November and becomes progressively worse from then until spring. The last two summers having been unusually humid, the summer improvement has been less marked

and the winter retrogression correspondingly greater. It may be found with improved weather conditions that this high percentage does not hold for ordinary humidities. Because of this humidity increasing the toxæmia, we have had an increasing number of new diabetics, and the peak of insulin production and consumption in Ontario since its discovery. The other factor may be that we have been using a too alkaline culture medium which inhibits the growth of the staphylococcus.

In Case Report 1,<sup>1</sup> the infectivity of this organism was pointed out. It is hoped that further research will throw some light on the problem why in a family one member should develop diabetes, another pernicious anæmia, another arthritis and auricular fibrillation, and another genito-urinary symptoms with hypertension, and yet all improve when treated with a toxoid which is specific for only one organism and its toxæmia. We have been amazed at the tremendous range of symptoms which have increased during the negative phase of the toxoid therapy and improved during its positive phase.

Most of our patients have complained of intense physical fatigue, more marked in the morning and improving later in the day, while in the evening they experience something like normal strength. The majority of these were people of more than average intellect. They came complaining of physical fatigue, but the mental fatigue and inability to concentrate was so distressing them that it had caused some to consider suicide, because they felt that they were becoming insane. These patients are very reticent about disclosing mental impairment, but when told that it is a frequent symptom of this toxæmia readily admit its presence. The degree of mental and physical weakness was found to be largely dependent upon the extent of the infection and upon the humidity.

It is felt that a detailed list of these symptoms by systems might be enlightening, but before giving this we should like to cite the history of our longest unsolved problem case.

NOTE.—Throughout this paper, unless otherwise specified, "toxoid" will mean staphylococcic toxoid; "organism" will mean *Staphylococcus*, usually "hæmolytic"; "toxæmia" will mean the effect of staphylococcic toxin in the body, and "negative phase", the period of accentuation of symptoms following the injection of toxoid, which lasts usually about twenty-four hours.

## CASE 1

A female, aged 28. She was well, with the exception of children's diseases, until the age of 9 years, when she had rheumatic fever. She had a tonsillectomy at the age of 10, and three other operations subsequently to remove tonsil tags. At the age of 13 she reported stating that she had not been well since the rheumatic fever. Her main symptoms were mental and physical fatigue, some dyspnea on exertion and after eating; occasionally oedema after periods of prolonged physical effort. On examination we found tachycardia (110 to 120), a blood pressure of 92/65; a mitral systolic murmur; lymphoid patches in the throat; minimal tuberculous lesion of both apices; and tenderness over McBurney's point. She had just developed hay fever, showing marked nasal congestion, her evening temperature ranging from 99 to 100° F.

This patient had recurring attacks of subacute appendicitis, with increasing bronchitis, during the winter months. She was found to be sensitive to ragweed, pollen therapy relieving this to some extent. At the age of 19 appendicectomy was performed. Subsequent to this mucous colitis and night sweats developed. Her pulse was 124, and weight 89½ lbs. (standard weight 115).

At the age of 20 purulent nasal discharge and left antral tenderness developed. X-ray showed involvement of the right anterior ethmoid and slightly less of the left; secondary degree tuberculous involvement of the upper right lobe, slightly less of the left. A gastric series showed lack of haustration, but no evidence of tuberculous colitis or enteritis. A barium enema showed marked hypermotility, but not of the type usually seen in colitis, and it was suggested that this was reflex in character. The patient complained of marked pain in the lower dorsal and lumbar intercostals, but a skiagram of the spine was negative. The gall-bladder was x-rayed, and was reported as functioning badly. The sputum and stool were negative for tubercle bacillus, and the latter negative on animal inoculation. Sanatorium treatment was advised but found impracticable, so it was instituted at home without improvement at the end of 6 months. At the age of 21 a thyroid adenoma was removed without improvement. At the age of 22 she developed severe bronchitis during December and January, with a suggestion of diaphragmatic pleurisy. Small doses of tuberculin were used, but this only increased the pulse rate and dysentery, and was discontinued. The stools were from 3 to 4 daily. Although slight oedema was present an electrocardiogram showed muscular impairment only. Examination showed the heart to be essentially normal. A mitral murmur was heard over the mitral and pulmonary areas; the pulse was 100 to 110, irregular; blood pressure, 95/65; temperature 99 to 99.2° F.; white blood count, 10,000. The cardiologist's diagnosis was cardiac neurosis of unknown origin.

At the age of 25 double anterior ethmoiditis was diagnosed and double anterior ethmoidectomy and double maxillary antrotomy was performed. Staphylococcus was found in pure culture. At the age of 26 a double antrectomy was performed. The patient showed glycosuria, but this was due to a lowered renal threshold for glucose, and the glucose curve was normal.

At the age of 27 the patient started on toxoid therapy with marked clinical improvement. The haemoglobin and non-filament count returned to normal; the white blood count was lowered, but not to normal limits. The pulse rate was lowered to 90, with an elevation in blood pressure; there was also lessened post-nasal discharge. Her colitis improved and the stools, which had been as many as 8 to 12 daily, decreased to 2 or 4. During the summer the patient was given pollen antigen with further improvement. At the age of 28 the toxoid was discontinued in April, and no pollen therapy was given during the summer. In June, the patient had bright red rectal hæmorrhages accompanied by dysentery,

having from 8 to 12 stools daily, and associated with marked hay fever, necessitating complete rest in bed. She started toxoid again in October, and the pulse rate is now between 80 and 90; blood pressure 116/74; stools twice daily. The patient is able for the first time in many years to undertake part-time work.

She had previously developed a purulent vaginal discharge and frequency of micturition. Rectal examination showed enlargement and tenderness of the left ovary. Culture showed hæmolytic *Staphylococcus aureus* and a non-hæmolytic streptococcus in a catheter sample of urine. A vaginal smear and stool were negative for staphylococcus, but these were taken after the symptoms had subsided.

This case is most interesting. A variety of consultants had seen the patient during the sixteen years while she was under our observation. They were unable to make a diagnosis as to the etiological factor behind this syndrome, and suggestions as to treatment were either futile or definitely harmful. With toxoid this patient has shown greater improvement than she did in the previous fifteen years, and decided improvement or disappearance of the multitude of symptoms which she previously had. We feel that the undiagnosed pansinusitis of staphylococcic origin was responsible for these varied and widespread symptoms.

During the course of this staphylococcic toxoid therapy, we were unfortunate, or fortunate, enough to use certain lots of toxoid which were clinically unsatisfactory. From the improvement of many symptoms which up till then had been uncorrelated with staphylococcic toxæmia, and from the sudden exacerbation of these symptoms with the toxic lots, the authors were enabled to gain the material for this paper. This exacerbation of symptoms following the use of certain lots of toxoid was observed in every one of our 180 cases, whether they were just commencing treatment or had been worked up to a much larger dose.

## THE RESPIRATORY SYSTEM

On examination most patients displayed hypertrophic lymphoid patches in the pharynx, particularly marked on the lateral walls. In some cases these lymphoid bands were so thick as to reach from the posterior wall of the pharynx forward to the soft palate, thus leaving only a narrow respiratory passage immediately behind the uvula. No local symptoms of soreness were present, and the patients were often totally unaware of this hypertrophy. During periods of increased humidity this focal infection in the pharynx extended upwards into

the nasopharynx and downwards into the trachea. In very few cases was there further progress into the bronchi or bronchioles. On physical examination practically no signs were discovered in the chest, and yet, on appropriate treatment, large amounts of thick purulent exudate were obtained from the tracheal wall. In Case 1<sup>1</sup> this was so severe that the inflammation extended to the œsophagus. The symptoms at first were not unlike those of hyperacidity; later, as the infection extended into the œsophageal wall, severe spasm developed on the passage of solid food, necessitating liquid diet. Several similar cases have been noted in our practice, one of whom showed a distinct œsophageal ulcer on œsophagoscopy.

Upward extension of the infection into the upper nasal passage caused general congestion of the nasal mucosa. Only in the most severe cases and those with a leukocyte count of over 20,000 were there signs of nasal or post-nasal discharge, and this frequently was only mucoid. Apparently this organism, which produces pus in cutaneous infections, does not produce a purulent exudate in the respiratory tract except in the most severe cases.

Several cases of migraine have come under our observation and investigation. It was felt from the parietal and occipital nature of the pain that we were dealing with ethmoidal or sphenoidal involvement. Our routine practice in radiology has been described.<sup>1</sup> In order to find minimal lesions these patients were x-rayed during both dry and humid weather, or when their symptoms were most marked. By this method we have been able to demonstrate some involvement of the sphenoid which was apparently minimal and œdematous in nature. The pain or heaviness which is so frequently encountered in the occipital region and which is relieved by hyperextension of the neck is pathognomic of ethmoidal involvement. All of these patients during attacks had high blood inorganic phosphates, high blood cholesterol, and high or high normal blood chlorides. In the majority of cases these blood findings returned to normal during the interval between attacks.

Several cases of asthma have been met with, and by treatment have been distinctly improved. All of these showed exacerbations of their asthmatic condition during the negative

phase of the first three or four treatments. Furunculosis of the anterior nares has been frequently seen in our series of cases.

In Case Report 1<sup>1</sup> it was pointed out that with chronic staphylococcic infection in the upper respiratory tract there are few or no local symptoms. With the addition of streptococcal infection there was marked local soreness and increased pyrexia without any mental depression or exacerbation of the diabetic state. In the cultures from swabs it has been noted repeatedly that at the end of 24 hours isolated colonies other than staphylococcus were present. At the end of 48 hours the staphylococcus had destroyed all others, which suggests that it is particularly virulent, and we already know that it is very resistant. The freedom from colds of well-immunized patients has been constantly noted, and it is interesting that a diabetic cured for some years is the only diabetic so far in whom a swab negative for staphylococcus has been obtained.

#### THE HÆMATOPOIETIC SYSTEM

The first patient to receive liver extract in Canada was the most interesting case in the series. Here the typical text-book description of the disease was lacking, because of staphylococcic focal infection in the upper respiratory tract and chronic cholecystitis, which superimposed a picture of secondary anæmia on that of the primary. At no time in this patient's history has she had a colour index of over one, in spite of the fact that blood smears during severe exacerbations were typical of primary anæmia. For this reason we have administered iron and copper<sup>a</sup> as well as liver extract, and have found this most effective. With the use of toxoid, liver extract, which was given by mouth, was found unnecessary. No improvement was noted in the cord lesions which accompanied the disease. The use of clinically unsatisfactory toxoid in our pernicious anæmia and diabetic cases necessitated a return to liver and insulin therapy.

#### CASE 2

This patient came under observation during her first remission in January, 1933. Her blood sugar was definitely above normal limits (0.184 per cent post-prandial). Her brother had died in 1927 of pernicious anæmia and diabetes prior to the discovery of liver therapy. Her mother died of pernicious anæmia. She had had a number of teeth extracted, the cultures of which were evenly divided between *Streptococcus viridans*

and *Staphylococcus aureus*. This patient had a tonsillectomy and left antrotomy in October, 1933. A culture from the antrum showed *Staphylococcus aureus*. With toxoid she also was able to discontinue liver extract.

Because this organism does not grow well in an alkaline media, and because of the severe exacerbation in our genito-urinary cases when we tried an acid-forming diet, as recommended by Helmholtz,<sup>4</sup> we felt that in our pernicious anæmia cases the administration of hydrochloric acid might relieve their gastro-intestinal symptoms, but would increase the focal infection and anæmia. We are now using a combination of citric and tartaric acids with pepsin,<sup>5</sup> which is acid in the stomach and alkaline when absorbed. This is giving very satisfactory results in anorexia, flatulence and gastro-intestinal distress and discomfort.

#### THE CIRCULATORY SYSTEM

The majority of our cases showed hypotension with tachycardia, more marked during the winter and spring months, and accompanied by a slight pyrexia ranging from 99 to 100° F. at either four or eight o'clock p.m. Some cases with kidney involvement showed marked hypertension, and blood pressure elevations as high as 230 systolic have been recorded. This elevation is apparently due to kidney damage involving the water excretion, giving rise to a water lag, the night urine being equal to or often double the day output. This water lag, coincident with blood pressure readings, was checked daily on several cases and correlated with the humidity. The blood pressure was found to be elevated and the lag accentuated during and immediately following days of extreme humidity, and both were distinctly improved during dry weather. Further, the same elevation was found during the negative phase of toxoid injection, and materially improved as the patient progressed into the positive phase. Finally, as the patient developed further immunity these variations in humidity did not affect the water excretion, nor did we find blood pressure elevations.

The patients with hypotension similarly experience a lowering of the blood pressure during the negative phase in the early doses, and a return toward normal blood pressure as the treatments progress. Certain abnormalities were discovered by electrocardiogram in patients, both during the negative phase and

during periods of increased toxæmia. In severe cases fibrillation was discovered, which disappeared under treatment with toxoid.

#### THE DIGESTIVE SYSTEM

Small ulcers on the tongue and oral mucosa were noted in a number of our cases and improved. Reference has previously been made to the œsophageal involvement from the trachea. We have pointed out<sup>1</sup> that 57 per cent of our diabetics have chronic cholecystitis, confirmed radiologically. In our non-diabetic series, not, however, confirmed by radiology, a similar number were found to have this complication on clinical examination. Whenever there was an acute exacerbation of the upper respiratory tract infection, gastro-intestinal symptoms developed. Since Magner and Hutcheson<sup>5</sup> found staphylococcus in the submucosa of 43 per cent of the chronic or fibrotic type of gallbladder in their series, it is not surprising that these cases improve when treated with staphylococcic toxoid.

Several cases of gastric and duodenal ulcer have been met with, and the symptoms from these lesions were found to increase during periods of increased humidity and during the negative phase of toxoid treatment, and to improve or disappear with toxoid treatment and improved weather conditions.

#### THE URINARY SYSTEM

We have pointed out<sup>1</sup> that a number of pure cultures of staphylococcus had been obtained from female diabetics from catheter samples. The same was also true for non-diabetics, and profiting from our experience with our diabetics, we instituted alkali therapy with complete disappearance of both pus and symptoms. All these cases of cystitis and pyelitis during the early stages of toxoid treatment showed showers of pus with exacerbation of symptoms during the negative phase. We have referred previously to the improvement in water excretion.

#### THE REPRODUCTIVE SYSTEM

Many cases of chronic cervicitis associated with this upper respiratory tract infection were cultured, and staphylococcus was found either in pure culture or associated with other organisms. In a number of our cases this cervicitis was associated with a chronic oöphoritis, and the symptoms of this disease were accentuated dur-

ing increased humidity, menstruation, and the negative phase. We feel that this is also true of chronic prostatitis in the male, and investigation is under way to test this theory.

#### THE ENDOCRINE SYSTEM

In this type of chronic infection of the upper respiratory tract the authors have met with a large number of hypothyroid cases and also a smaller number of hyperthyroid cases. In Case Report 1<sup>2</sup> one of the latter is described. In Case Report 4<sup>1</sup> a distinct hypothyroid condition developed after antrotomy and tonsillectomy, when this organism was found, her basal metabolic rate reaching a level of minus 23 per cent. Just as in our diabetics staphylococcal toxin is inactivating insulin, we think that in some cases it is inactivating the thyroid hormone. We feel that sometimes the basal metabolic rates are elevated, while actually a hypothyroid condition is present. Cases on 25 grains of thyroid daily rose to plus 27 per cent during an acute exacerbation of infection, and returned to normal when the acute infection had subsided. The diet and thyroid dosage were unaltered during this time, and allowance was made for fever if present.

One patient has been on a weighed diet of 1,000 calories for a number of years. On this diet she increases in weight during damp weather with an exacerbation of her sinus infection, while on exactly the same diet and thyroid dosage in good weather, with quiescent infection, she will lose from three to four pounds a week. At all times this patient has shown clinical symptoms of hypothyroidism, despite the fact that basal readings have been obtained ranging from plus 28 per cent during an acute infection to minus 17 per cent during periods of quiescence. Bearing in mind the improvement in hyperthyroidism which has been obtained by removing foci of infection, it is felt that all except emergency cases of hyperthyroidism should have a course of staphylococcal toxoid in order to decide the causative factor for the symptoms of tachycardia, mild pyrexia, perspiration, and, frequently, loss of weight which are present in both conditions.

We believe that a large number of our female patients in this region require a small dose of thyroid during the winter, which can be discontinued during the summer when this

infection is quiescent. One case of hyperadrenalism has been investigated, and was found to have this infection associated with glycosuria and hyperglycemia, and there is some indication in this case that the cortical hormone has been inactivated by this toxemia.

The effect of this toxemia on the reproductive hormones has been shown in a number of our cases. Conception had occurred prior to toxoid treatment only in the late summer and early fall, and was probably due to increased endocrine activity while free from infection. Several pregnancies following or coincident with toxoid treatment of both parents have occurred. Further surveys correlating humidity with conception and birth rates are in progress, and should be enlightening. In this connection the work of Mills is most interesting.<sup>7</sup>

#### THE NERVOUS SYSTEM

We have pointed out that associated with this staphylococcal infection there is a profound mental lethargy and a marked inferiority complex. Several of our patients have had to be admitted to institutions for observation and treatment. The coincident use of toxoid and psychiatric therapy has returned all these cases to normal. These patients are highly intellectual, and the inability to concentrate and remember has, in some cases, led those who thought they were becoming mentally defective or incurably insane to commit suicide. A surprising number of patients have admitted that suicidal intentions have been held many times during this toxemia. It is suggested that toxoid therapy might be worthy of trial in psychiatric institutions, as it is felt that this toxemia is a possible cause or complication of a great many of our nervous breakdowns, which certainly have been more numerous during this period of abnormal humidity. This nervous depression is seasonal rather than cyclical. In the course of our treatment we have had marked hypoglycemia in non-diabetics as well as diabetics which is best relieved by taking milk. This hypoglycemia frequently produces insomnia, and the use of sedatives has been eliminated by the addition of food to relieve these symptoms.

The work at Cornell University among "cold susceptibles"<sup>8</sup> has been enlightening. With bi-weekly ultra-violet radiation, alkali therapy, and

diet from October to May they have been able to reduce the non-attendance at lectures in one year by 46 per cent in this group. Since this same régime is of great benefit in the treatment of chronic staphylococcic infections of the upper respiratory tract, and since the university year on this continent coincides with the period of greatest incidence of staphylococcic infections we feel that these chronic infections are of importance in the etiology of the common cold. This is borne out by the freedom from colds of well-immunized patients.

We have pointed out<sup>1</sup> that in diabetics toxoid therapy tends to return the blood chemistry and blood counts to normal, in spite of adverse weather conditions. This is true also of non-diabetics. The original toxoid treatment as outlined<sup>1</sup> has had to be modified in some cases to an initial dose of 0.01 c.c. or 0.0125 c.c. of this product. Increases correspondingly small, with frequent stationary periods, and sometimes dosage retrogression during periods of excessive humidity, have given better results in some cases.

Now that full clinical records have been obtained with this material, which is specific for only one organism and its toxæmia, the authors are combining its use with that of a stock vaccine made from the organisms found in common colds during the early fall of the current year. By so doing it is hoped to immunize patients not only against their own chronic infection but against intercurrent infections as well. In previous years we have used vaccines, bacteriophages, surgery, and ultra-violet radiation, but we felt that the use of toxoid, particularly when combined with ultra-violet radiation, is the most effective treatment we have had to date. From the improvement that has occurred at the site of infection, we feel that the necessity of surgical intervention will be greatly lessened, and that in the more severe cases toxoid combined with surgery will produce better and more lasting results than any we have found from surgery alone. In our experience surgery alone gives lasting improvement only in the milder cases, and hence arose the popular belief that sinus surgery, once started, had to be continued.

Mixed infra-red and ultra-violet radiation, such as is obtained from a carbon arc lamp, was found most helpful in this type of chronic sinusitis and tracheitis.

#### DRUGS

The authors have evolved an alkaline cough mixture<sup>c</sup> and an alkaline nasal spray<sup>d</sup> which have been useful in attacking the focal infection in the upper respiratory tract. The pepsin mixture<sup>b</sup> has already been described. Because of the usefulness of tin preparations in the treatment of staphylococcic infections of the skin, we have recently tried a tin proteinate<sup>e</sup> in a number of cases with very good results. There was marked improvement in the blood counts and general physical condition.

The cost of the research leading up to this and other papers has been borne so far by the authors personally during the last nine years. This paper is published at this time merely as a preliminary report, in order that the indications of usefulness therein may be followed more quickly to completion by other research organizations or groups who are better fitted financially to undertake this work.

#### CONCLUSIONS

1. That staphylococcic infection of the upper respiratory tract is present in many cases of chronic ill health in Ontario.
2. That because of the lack of local symptoms it has been undiagnosed previously.
3. That it has been producing numerous symptoms elsewhere in the body, and that with the use of staphylococcic toxoid these symptoms are improved or cured.
4. The freedom from colds of patients on staphylococcic toxoid suggests that this organism may be an etiological factor in the common cold.

The medicines referred to have been made for us by Ingram and Bell, Toronto. They are named as follows: (a) Ferrosyn; (b) Gastrol; (c) Tracheol; (d) Alkaphedrine; (e) Stannosyn.

Our thanks are tendered to Dr. J. T. Fotheringham for his constant interest and encouragement and his literary supervision of the authors' efforts; to the staff of the Provincial Board of Health Laboratories for their help with the bacteriology; to the staff of the Meteorological Office for their interest and help with weather forecasts and humidity readings; and to the patients who suffered the vicissitudes of toxoid, the mistakes and illnesses of the authors, and yet remained loyal.

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## SEVEN YEARS OF SPINAL ANÆSTHESIA IN PRIVATE PRACTICE

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SPINAL anæsthesia has been accepted in the great clinics and is slowly but surely extending over the country. All I shall endeavour to do here is to set down a few basic facts and primary principles as a guide. Some statements, for the sake of brevity, are dogmatic. The first point is that the person giving the injection should know spinal anæsthesia *and the patient*. He should read two or three good authorities on the matter, particularly as to theory, etc., then spend a week or two at the elbow of a busy expert.

Spinal anæsthesia is not to be employed indiscriminately, and its use improperly, both as to patient and supervision, is giving an otherwise fine procedure a bad name. Other things being equal, it is risky in just the type of case that any anæsthetic or operation is considered risky. However I believe that with proper precautions it will show less morbidity and mortality than most anæsthetics in all types of cases. Later on some precautions in specific conditions will be given.

Granted that the administration of the anæsthetic should be in the hands of one versed in the procedure and in the patient's condition, the actual injection is a surgical procedure and in private practice it would seem reasonable that the injection should be made by the surgeon who has first studied the procedure and who has studied his patient. Let me add that in all cases a competent man should always be on hand to take charge of the patient as soon as the injection is given; a man who, first, knows all the danger signals, knows what to do to meet them and who can give a satisfactory supplementary anæsthetic if required. On rare occasions it appears impossible to make a proper tap, and a general anæsthetic must be given. When a bloody tap is obtained refrain from making an injection. Shortly, a good anæsthetist should always be on hand and give the patient his undivided attention; moreover this anæsthetist should be a fully qualified and licensed medical practitioner. It is, perhaps,

quite human for the anæsthetist to be a bit, to say the least, disinterested in the whole procedure when asked to perform what he may consider a minor part in his own specialty. On this point I have told my associates that the use of a spinal anæsthetic will not save any of their time or take anything out of their pockets, for I believe they are carrying just as great a responsibility and are entitled to the same remuneration as when they are giving an inhalation anæsthetic. One cannot blame the anæsthetist under the circumstances for an "also ran" feeling. However, if the opinion of the primarily responsible person indicates, rightly or wrongly, that it is to the welfare of the patient to do thus and so, that is enough for most thinking men and their hearty co-operation will be assured.

The question is asked frequently — "do you have any difficulty getting the consent of the patient for a spinal anæsthetic?" The answer is "No." The reason is that consent is not requested. It was observed that the patient who knew he was going to have something different — something "funny" put into his back, or however he conceived the circumstances in his own mind — did not do so well as the one who knew nothing of the procedure. The question came up, if consent was not desirable was it necessary? The decision was that it was in no wise necessary. Certainly we do not ask patients will they have chloroform, ether or gas, and what kind of gas; we do not say "Shall I do an anterior or a posterior gastroenterostomy?" nor do we say "What type or colour of antiseptic do you wish applied to the skin of your abdomen?" So why ask the patient to pass judgment on what type of anæsthetic is good for him? Simply do not ask foolish questions.

A word as to equipment. This is as follows. A good syringe with a glass barrel marked off in tenths of a cubic centimetre, of a size large enough to hold comfortably in your hand, say, 10 to 20 c.c. You never require up to 5 c.c. of

content, but the smaller syringe is a bit hard to handle. Spinal puncture needles to fit this, of the smaller calibres, say 20 to 22, to make the spinal tap. Those with the shorter bevel make a sharp click as they go through the spinal membrane and perhaps are to be preferred on that account; besides, when they are in the spinal fluid, there is no possibility of the point being half in, as might occur with the longer bevels. All equipment should belong to the operator and be used only by him. He will then always be acquainted with the condition of his outfit. It is well always to have at least two needles boiled. Next, a "Sise" thumb-tack; this makes easier the use of finer needles. A 2 c.c. hypodermic syringe, fitted with a fine small needle with which to make a skin wheal of local anæsthesia. It is also well in addition to inject a little local anæsthetic into the interspinous ligament. A short needle of moderate calibre which fits the large syringe is required to fill this syringe by aspiration from the capsule after the crystals have been dissolved in spinal fluid.

When the tap has been made and the fluid is running freely out of the butt end of the needle it is not infrequent that in the subsequent manipulations of attaching the syringe, etc., the needle may be pulled out a little or pushed in. This may lead to the injection being made into the soft tissues outside of the meninges, causing a complete failure of the anæsthesia or an injection into the nerve substance, a *very dangerous accident*. To obviate this a simple appliance has proved satisfactory and saved many anxious moments. It is an ordinary "bulldog" tie-pin fastener; it is threaded backwards on the needle and pushed up to the shoulder before the puncture is made. The "Sise" thumb-tack is pressed well home when it is inserted. When the puncture is made and the flow of spinal fluid is free the fastener is immediately and carefully slipped down until it rests firmly against the thumb-tack. Now a little pressure on the needle will ensure that the fastener has grabbed tightly. The needle cannot, therefore, go in any further; should it pull out a bit, a hiatus will appear between the fastener and the thumb-tack and the needle can be re-inserted this short distance. One must *at all times be positive that*

*the flow of the spinal fluid is free at the tip of the needle.*

*The drug to be used.*—Choose some *one* simple preparation, made by a reliable concern. Get to know it and do not change as long as the results are satisfactory. Use no mixtures and beware of expansive trade literature. Personally, I prefer the French "neocaine", but that does not mean that it is any better than the others. The dosage should be as small as you dare use—a little supplemental gas or ether will do no harm. From 0.10 to 0.15 gm. should cover the field of most men's work. Do not try to do anything above the diaphragm. Do not see how high you can get the anæsthesia; see how low you can keep it and still carry out your operation with facility. These dosages will give you up to an hour of good anæsthesia, the smaller doses for the lower operations and the larger for the higher. There are other considerations which vary the dosage; these we will come to in their proper place. Avoid using spinal anæsthesia in patients under fourteen or fifteen years until your experience is extensive; then use your own judgment. The longer you refrain from its use in younger children the less likely you are to ever come to it, while with adults, the more you use, the less chance of your using anything else. Be cautious in old people.

For a longer anæsthesia, after considerable experience with procaine crystals, nupercaine, not more than 2 c.c. of the 1/1,000 solution, is satisfactory. The worst reactions, and at the same time the best prolonged anæsthesia, I have obtained were with the use of nupercaine and procaine combined. Hold off for some time before trying this combination. It is better to be content to wait a few minutes extra for the nupercaine to be effective when it is being used for a long anæsthesia. Nupercaine is more toxic and may produce more severe reactions. Bad as a few reactions were, they were not too alarming and were quickly controlled by the proper procedure. Panto-caine is midway between procaine and nupercaine as to toxicity and duration of anæsthesia. There have been no fatal cases. Moreover there have been no neuro-reactions beyond an occasional headache early on, which I attribute to the use of "barbotage". Few have occurred

since this was stopped. Which brings us to the method of injection.

The patient lies on one side on the operating table. An assistant acutely flexes the spinal column, getting the chin and knees of the patient as close together as possible. The assistant steadies the patient on the table, and, with one arm behind the neck and the other under the knees, maintains flexion of the spinal column and keeps the plane of the back at right angles to the table. The upper shoulder tends to sag forward and must be kept back in line with the lower shoulder. This is valuable, as it prevents torsion of the spinal column and facilitates the location of the spinal canal with the tip of the needle. There are no angles at which to guess in making the puncture; the needle then can be directed parallel to the table top. An ample area of the lumbar region is cleansed and sterilized, as for any operative procedure. The back is draped with a sheet in the centre of which is a small opening, say four inches by one inch. The spinous processes of the lower lumbar vertebræ are palpated and a greater space will be found between two of them. This is usually between the third and fourth, but, wherever it is, use this for the injection. Press firmly for a few seconds just below the upper process of this space. This makes the hypodermic prick less painful and marks the space for injection. Then insert the local anæsthetic needle, mounted on a 2 c.c. syringe loaded with 1.5 to 2 c.c. of 2 per cent procaine solution. This needle should be inserted just below the lower edge of the upper spinous process. First a skin wheal is made, and then the needle directed straight in at right angles to the skin until the firm interspinous ligament is reached and this region infiltrated. The thumb-tack is inserted in the same direction, that is, straight towards the front of the body, neither deviating towards the head or foot nor right or left. It must be inserted as close to the lower edge of the spinous process as possible, and is pushed well home.

Now the spinal puncture needle with the stilette in position is threaded through the thumb-tack and pushed in till it enters the spinal canal with a click. Should bone be encountered it may be withdrawn part way and tilted slightly towards the patient's head.

Rarely, it will be found necessary to tilt it downward toward the feet. The stilette may be withdrawn at any time to test if the tap has been successfully made.

When the tap is completed the "bulldog" fastener is pushed forward firmly against the base of the thumb-tack. About 1 c.c. of spinal fluid is allowed to drop into the capsule containing the crystals, the stilette replaced, and the capsule shaken to facilitate the solution of the crystals. When these are fully dissolved the fluid is drawn into the larger syringe through the short larger needle, which is then removed, and the syringe is attached to the spinal tap needle, the stilette having been again removed. A small amount of fluid is withdrawn by pulling out the syringe piston, to be certain the tap is clear and the injection made. When the smaller doses are used for the lower operations, 1 c.c. of fluid is sufficient. As the doses increase and the operation is to be higher this amount is gradually increased by further withdrawal of the piston, but need not be beyond 3 c.c.

The speed of injection is an important consideration. It seems evident that the effectiveness of the anæsthetic is directly in proportion to the concentration of the solution coming in contact with the spinal nerve roots. Should the injection be made slowly there is too great diffusion. Therefore the plunger of the syringe should be pushed home smartly.

As soon as the injection is completed and the needle and thumb-tack removed, the skin puncture should be touched with the antiseptic being used, the patient turned on his back, and the head of the table lowered immediately. Shoulder pieces must be put in position before the table is lowered.

It has been observed that in patients who react favourably to the preliminary sedatives a smaller dose of the anæsthetic will suffice. In those cases where even larger preliminary sedatives do not produce sleep one must use larger doses proportionately. This brings up the point of pre-anæsthesia medication. There has been some controversy over the use of ephedrin. I used this for two or three years, but found that it interjected an unknown quantity into the post-operative period. We do not thoroughly understand this drug as yet. The purity of the preparation may be in ques-

tion. The individual reaction to it varies greatly and the different effects of the varying spectroscopic elements in its make-up are not understood completely. A persistently rapid pulse after operation may be due to the ephedrin or to shock, or to post-operative hæmorrhage. These and other considerations brought about its elimination as a routine procedure. Since it was discontinued there have been no reasons for regret. There is one condition only wherein it is felt that it still may hold a place and that is in patients with high blood pressure.

As to preliminary sedatives, almost any of the barbiturates are satisfactory. Large doses of phenobarbital, 10 to 15 grains, have been used with satisfaction. They should be preceded by a test dose of 2 or 3 grains the night before operation. However the newer and quicker acting preparations are probably an improvement. *In all cases wherein any liver damage may be even suspected, barbiturates must be entirely avoided.* In addition to the barbiturates it is well to give some morphine, combined with either hyoscine or atropin, one-half hour before the operation.

As to diet, a light farinaceous supper may be given and any fluids up till midnight. Thereafter and until one hour before operation, except in gastric cases, any clear fluids, avoiding milk, are to be given in considerable quantities.

In the cases where the operative risk is greater, certain precautions will avoid difficulty. In cases of high blood pressure, as previously suggested, a small dose of ephedrin may be given with the local anæsthetic. This may appear to be paradoxical, but, as a matter of fact, where the danger is a drop in blood pressure the higher the pressure, the greater may be the drop, and so the greater the danger. Moreover these patients' mechanism for circulatory adjustment is at fault and so they must be protected as much as possible against a change in circulatory environment.

In anæmic patients and those with severe shock be most careful about deciding on spinal anæsthesia. Blood transfusion should be given not only before the operation, if indicated, but always during the operation. In debilitated patients and in not too severe cases of anæmia or shock this may be replaced by intravenous

glucose and saline given during the operative procedure, or, better still, 6 per cent acacia in normal saline.

The outstanding danger signals are *dropping blood pressure* and *slowing of the pulse*. These must be watched for continuously during the first twenty minutes, as they may change quite rapidly during this time. Any changes after this are more gradual. A drop of 20 or 30 mm. of Hg. in the systolic pressure needs no special attention provided it is not accompanied by other symptoms, such as nausea, vomiting, dyspnœa, or slowing of the pulse, etc. Any of these latter signs or a further drop in blood pressure call for the immediate hypodermic injection of 0.25 to 0.5 of a c.c. of adrenalin solution, 1/1000. The rapidity of the favourable response to such an injection is remarkable. A hypodermic syringe loaded with 1 c.c. of this solution should be prepared before the operation begins. In the cases where a transfusion or an intravenous injection is being given the adrenalin solution should be made ready in a 10 c.c. syringe, 1 c.c. of the solution being diluted to 10 c.c. with normal saline. When occasion demands, 1 c.c. of this diluted solution is to be injected directly into the tube leading to the intravenous needle. This injection must be made very slowly. *Do not give more than 0.1 c.c. of 1/1000 adrenalin solution intravenously at one time.* After either the hypodermic or intravenous injection of the adrenalin the blood pressure must be checked. It should rise slowly in the former during five minutes. In the latter, that is, the intravenous injection, the response will be much more rapid. Should the reaction not be satisfactory the dose may be repeated. A second drop in blood pressure may occur and is to be treated in a similar manner. A further lowering of the head of the table should accompany these injections.

For the nausea associated with the fall of blood pressure, in addition to adrenalin injections or independent thereof, deep inspiration is helpful. By encouraging deep breathing vomiting may be avoided. In addition to having the patient take deep breaths a few inhalations of carbon dioxide (5 to 10 per cent) and oxygen will produce deep respiration. It is well throughout the operation, especially if this is prolonged or on the upper abdomen, to encourage deep respiration, either voluntary or by

carbon dioxide and oxygen. At the end of the procedure give inhalations of this mixture for two to three minutes before the patient leaves the table, as is done after a general anæsthetic. If pulmonary complications are feared, as in surgery near the diaphragm, or are, in fact, reasonably possible, this latter procedure should be carried out four to six times every twenty-four hours for the first two to four days after operation. All of these procedures tend to lessen post-operative pulmonary complications in any anæsthesia, and are particularly applicable to spinal; therefore one may expect less pulmonary trouble with spinal anæsthesia properly managed. Many other ways of meeting emergencies have been recommended. The above have successfully met every one that I have encountered, and the more drastic procedures have so far proved to be unnecessary.

When the operation is completed the patient is to be returned to bed on a cart which has either the feet elevated or the head lowered. The bed must have the foot well up before the patient is put therein. This elevated foot position must be retained for at least two hours. If there are no contraindications it is well to maintain it for four hours, gradually bringing the bed to the level during the last hour. This level position should be retained for two hours after which, if indicated, the head of the bed may be slowly raised. Should the patient develop a headache, go back immediately to the elevated foot position. Should any sign of collapse appear a hypodermic of adrenalin should be given. Immediately on return to bed a large rectal injection of warm saline is well tolerated and most useful. One may add to this 1 per cent glucose. As much as 20 oz. should be given by slow enema, which may be repeated in three to four hours. Clear fluids may be given in small quantities immediately on return to bed and even during the operation except where specially contraindicated. However, there appears to be even less trouble with distention if fluids by the mouth are withheld for twelve to twenty-four hours

As to the bowels: do not give any stimulating enemata for at least forty-eight hours. Longer delay will frequently allow a natural passage of both gas and fæces. Should something be required the use of either glycerine suppositories or small injections of warm glycerine, one to three ounces, should be all that is required.

The usual opiates, sedatives and supporting treatment may be given, as indicated. While this point has nothing to do particularly with lumbar anæsthesia, it is not out of place here to plead for less frequent wound dressings. Meddling with a well applied sterile dressing should never occur. If the wound is clean the only time the dressing should be opened is to remove clips and sutures in their proper time.

#### SUMMARY

Spinal or lumbar anæsthesia gives the best opportunity for atraumatic surgery. The skeletal muscles are relaxed; the visceral muscles are in tone; retractors and laparotomy sponges can almost be discarded. The traumatic shock is thus lessened at its origin, and, in addition, it is blocked at the spinal nerve roots and so does not reach the cerebral or spinal centres. There is lessened toxæmia. Fluids are well taken and retained immediately before and after operation. Nausea from the anæsthetic is practically eliminated. Post-operative distension is very greatly reduced. Patients who have had both general and spinal anæsthesia and come to a further operation, very frequently demand to be saved from the undesirable effects of a general anæsthetic by having the spinal repeated.

Besides lessening intestinal ileus or abdominal distension, spinal anæsthesia may be successfully used as a treatment for post-operative or post-traumatic ileus not due to organic obstruction. This is just mentioned now; the subject cannot be fully discussed here, as it requires a paper unto itself.

I wish to thank Dr. J. H. Burgess, anæsthetist for the Grace Hospital, Ottawa, for his cooperation herein.

TUMOURS OF CAROTID BODY.—R. W. Cragg (*Arch. of Pathology*, 1934, 18: 635) reports the occurrence of simultaneous tumours of the carotid body, the accessory suprarenals, and the organs of Zuckerkandl. All the tumours were strongly chromaffin-positive, but yielded

no adrenaline by chemical testing. The patient had a normal blood pressure, and no history of paroxysms of hypertension. These observations cast even more doubt on the association between chromaffinity of cells and their production of adrenaline.—Abs. in *Brit. M. J.*

## THE PHARMACOPŒIA FOR THE INDIGENT, THE INSURED, AND THE ORDINARY PATIENT\*

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THE indigent is a familiar patient to the practitioner of medicine who has always taken pride in his charity and in his care for those who could not pay; but when the financial crisis put at least 10 per cent of the population in this class, and many of the remainder find it hard to pay, or will not do so, the physician is unable to carry on his good work without assistance. Unfortunately, the care of the indigent is not equally distributed, and some physicians find that the larger part of their practice is amongst those unable to pay. Governments, municipal, state or federal, have been forced in the interest of the public health to remunerate the physician in some part for his services to the indigent.

Nor will a wave of even moderate prosperity put all the present indigents into the class of paying patients. The advent of insurance against ill-health, unemployment and old age, whether industrial or governmental, means that many of the unemployed of forty to forty-five years and over will not be employed again; we shall have a class of permanently unemployed. The indigent is with us and the insured either is or soon will be. The State must contribute to their medical care. Yet if the State is to pay for medical services and the remedies supplied to these two classes it must in the interests of the public health and of the costs to the State take cognizance of what the patients receive for the money contributed. Of the question of how the physician is to be paid for his services, I do not intend to speak, but wish solely to consider the question of drugs.

When the State directly, or indirectly, pays for drugs, it has a right to know that it is getting good value for its money. In every country where a national insurance scheme has been in operation the State has found that it could not afford to allow the physician to pre-

scribe any fancy new or old proprietary at an exaggerated price, or any new and much advertised drug. New drugs, like any new product, are bound to be expensive until mass production makes a decrease in price possible. Proprietary drugs or combinations always have an enhanced price owing to the cost of advertising, detailing physicians and druggists, undue costs of production, and a profit calculated on these exceptional costs. Consequently, state health insurance must limit physicians to standard articles whose cost is as low as efficient treatment permits. This as a rule means limiting the physician to the pharmacopœia. To the pharmacopœial lists must be added such life-saving drugs as have not yet been recognized by these publications. The discovery of insulin, for example, meant life and industrial activity to many people. In the interest of not only public health but of the State's pocket book such a drug as insulin must be supplied whether it is recognized by the pharmacopœia or not.

These considerations at once raise the question of the adequacy of the pharmacopœia. In the ordinary physician's practice even diabetes and pernicious anæmia are uncommon diseases, and, rarer still, Addison's disease and many others discussed in books on therapeutics. About 80 per cent of an ordinary practice and more than 80 per cent of ill-health are minor ailments. As a result of putting the question to many pharmacologists and professors of therapeutics I feel quite sure that there would be a general agreement to the assertion that, save for a very limited list of drugs and very exceptional diseases, the pharmacopœia provides all that is required.

This answer to the question is, however, not capable of the factual checking in figures to which we are so prone today. Let us then look at the matter from another angle. You all know "New and Non-Official Remedies" and the character of its contents. New drugs

\* Presidential Address before the Section of Pharmacology and Therapeutics, Combined Annual Meeting at Atlantic City, June 12, 1935.

today are rarely in the form of galenical preparations from plant sources, and rarely from new plants. The tenth edition of the U.S.P. admitted three new plants, *Krameria*, *Ipomea*, and *Rhus glabra*, and four galenical preparations of plants. "New and Non-Official Remedies" represents then the great source of potential additions to the pharmacopœia. Further, you all know something of the extreme care with which the U.S. Pharmacopœia is compiled, and the extreme efforts that are made to include every drug available under the regulations of the Convention which is either pharmacologically useful or generally employed by physicians. This pharmacopœia should then prove adequate for general practice. The last revision of the British Pharmacopœia also has led to the compilation of an excellent book, and is again closely in harmony with the needs of the practitioners.

If we exclude the medicinal foods, allergic reagents, vaccines and sera, ferments, and radio-active substances described in the 1924 edition of "New and Non-Official Remedies", we find 158 drugs described, with a host of proprietary names for them. Of these 158, only 23 appeared two years later in the tenth edition of the U.S.P. Some of those not gaining entrance, which are of more or less value, may have been rejected because they were covered by unexpired patents. This does not seem to be a very valid reason. Had the decision been left to me, I would have included a further 9 — Butyn, Sulpharsphenamine, Euphthalmine, Soluble Phenobarbital, Fluorescein, Papaverine, Urea, Acriflavine, Insulin, and of these only insulin is essential. In other words, about 126 substances were described in the "New and Non-Official Remedies" which in all probability will never be admitted to the Pharmacopœia. The British Pharmacopœia of 1932, largely compiled by the end of 1931, admitted 21 drugs described in "New and Non-Official Remedies" of 1929, out of a possible choice of 215. Again, I would have added 7 to the list. Judged by this analysis, even the ninth revision was considered by the Pharmacopœial Convention not far from adequate.

Now let us look at the list of drugs admitted to the U.S.P.X. Acetylsalicylic Acid, Carbromal, Barbitol, Phenobarbital, Amidopyrine, Strong and Mild Silver Protein, Epinephrine,

Fluid Extract of Belladonna Leaves, Whisky and Brandy, might well be employed fairly frequently in ordinary practice. Arsphenamine, Neoarsphenamine in syphilis; Quinidine Sulphate in certain cases of auricular fibrillation; Quinine Ethyl Carbonate in some cases of malaria; Ethyl Chaulmoograte and Oil of Chaulmoogra in leprosy; Carbon Tetrachloride for hookworm; Soluble Barbitol, either in mixtures or more particularly by injection, in cases of poisoning by strychnine and cocaine. Procaine Hydrochloride is the best local anæsthetic for injection, and is valuable in surgery. Dextrose is also intended for injection, largely in surgical cases, more rarely in medical ones; Chloramine, Dichloramine and Dakin's Solution are used in certain surgical cases; Thyroxin in rare medical cases. Benzocaine is useful, for example, to decrease the local pain after tonsillectomy; Barium Sulphate for the roentgenologist; Phenolsulphonaphthalein, a useful diagnostic reagent for the clinic. The remainder, in my opinion not necessary, were Acetyltannic Acid, Albumin Tannate, Calcium Iodobehenate, *Ipomea*, *Krameria*, *Rhus glabra*, Sodium Biphosphate and Chlorinated Paraffin. Others will probably differ with me on the details of the analysis, but it is evident that only a small proportion of the drugs added (10 or 11 out of 40) were such as would be frequently employed by the ordinary practitioner. Again, the pharmacopœia seems adequate.

This evidence then suggests, further, that there will be a few important drugs that should be added to the pharmacopœia from time to time, but that for the ordinary case the pharmacopœia will contain what the physician requires. But even the list in "New and Non-Official Remedies" is a carefully selected one. Many new drugs much advertised are not submitted, or are rejected. Yet obviously the physician uses them. The modern physician is one of the most gullible of mankind. The stock broker knows his weakness and the drug houses batten on his credulity.

Let us take a typical example. Evipan is discovered to be an excellent anæsthetic for certain cases, if given by injection. Anæsthesia is quickly produced, but quickly disappears. In about 25 minutes the patient is again awake. Those who have used it for anæsthesia recognize its limitations and that some persons are more readily affected than others. Its apparently

rapid destruction makes it relatively safe. Yet the proprietors are advocating its employment as a hypnotic, without any adequate proof of its usefulness in this respect, and in spite of the evidence of the rapid disappearance of its effects. The same type of claim is made for nembutal; yet there is no doubt that for the ordinary case of sleeplessness the pharmacopœial drugs, chloral and paraldehyde, or even barbitol, dangerous as it is, are to be preferred, and are, of course, much cheaper. The patient must be protected by the State from the gullibility of the physician, in the interest both of public health and cost.

But even more useless than the new synthetic drug is the flood of proprietary mixtures, either in themselves completely useless, or, if useful at all, unduly expensive. Even firms who are doing valuable research work and making available valuable drugs do not hesitate to exploit physicians and patients with their particular nostrums. If we submitted the following formula to experienced pharmacologists or therapeuticians would it be considered by them as a valuable remedy? Boric Acid 2 gr.; Potassium Carbonate 2 gr.; Extr. Buchu 1 gr.; Extr. Dog Grass 1 gr.; Extr. Corn Silk  $\frac{1}{2}$  gr.; Extr. Hydrangea  $\frac{1}{2}$  gr.; Atropine Sulphate 1/500 gr. Dog-grass (the official name in the 1914 Pharmacopœia was Couch Grass), was supposed to be a gentle diuretic but is of so little value that it was eliminated in 1932. Corn Silk and Hydrangea are also supposed to be mild diuretics. The dose of these three is given in grains and hence one would expect them to be solid extracts. Fluid extracts are the usual form in which these drugs are prepared, and consequently no estimation of whether even a supposedly efficient dose is contained can be made. Can any one believe that this preparation containing two grains of boric acid (when the official dose is 5 to 15 gr.), 2 grs. of Potassium Carbonate and 1/500 gr. of Atropine can be of any value in cystitis? Yet this is listed, and doubtless sold, by a large Canadian pharmaceutical house. No doubt a pardonable ignorance of the drugs used in folklore medicine and by the eclectics of years ago leads the physician of today not to recognize old and discredited drugs, but why should he not find out something about drugs unknown to him before he uses them on patients? This is one of the big blots on our so-called "scientific medicine".

In view of the number of deaths in children who have obtained a bottle of tablets of aloes, belladonna and strychnine, should we as physicians not ask ourselves whether strychnine is a useful addition to a cathartic? True, strychnine may make some patients feel better, but will it aid in the cathartic or laxative effect? For this there is no valid evidence. Yet one firm lists no less than ten tablets or pills of this type. One could give an infinite number of examples of proprietaries, cheap and inefficient, or even dear and inefficient. Surely the State cannot allow their employment when the public is paying.

Where national health insurance is in force the arguments advanced above have led to the physician's relying more on the pharmacopœia. Undue costs of remedies, owing to the use of proprietaries, have been avoided, and the public health has certainly not suffered. Were the physician to carefully and thoughtfully apply the knowledge he should gain in his courses of pharmacology, medicine and surgery while a student, he would find the pharmacopœia almost, if not quite, adequate for any case he is called upon to treat. But not only must he absorb the fundamentals as taught in the medical school, and as set forth in texts on pharmacology and the all too few books on therapeutics written by men who have a modern knowledge of the actions of drugs, but over and above all this he must learn the art of therapeutics by careful observation and thought. When I became an army physician "all boils looked alike to me", therapeutically, but soon I learnt that in treatment three classes became evident. Impetigo I learnt to handle in two different ways. All coughs are not alike in cause; one must distinguish at least four and probably more. No proprietary cough mixture, no physician's prescription will meet them all. The good therapeutician must do the two hardest things our profession calls for — think and observe. A third thing is necessary in learning the art of therapeutics, namely, careful cautious experimentation. These are the positive requisites. But there are negative ones. Firstly, the physician must realize that the progress of therapeutics is slow. Even in these days of remarkable advances few new first-class remedies are discovered. If they are, knowledge of them spreads into every good

medical journal within a year. The physician, before using them, should consult good authorities and read them critically. He should realize that not all that appears in print is true; that apparent success in a limited number of cases is not a demonstration of the therapeutic value of a drug. He must remember the natural history of the disease, its frequent spontaneous cures, or relapses. Drugs valuable, but not of life-saving significance, become generally known in two years. In the case of imminent death, one does not blame physicians or patients if they clutch at straws, but the physician must remember that in ordinary cases he has in the pharmacopœia an adequate medicine chest. The physician, then, must eschew and consign to outer darkness the detail man and refuse to be convinced by his plausible story. Proprietary literature and samples

should be consigned to the waste paper basket.

If the physician is to regain his place in the public esteem he must prescribe remedies appropriate to the case. He must on no account recommend a constipated patient to take a proprietary pill. He must treat the case and not allow the patient to become a victim of the vendor of nostrums. A subject of sleeplessness must be regarded seriously, not told to buy luminal tablets. If the physician does this, he becomes morally responsible for the poisoning occurring in those to whom this remedy is recommended by the patient. I appeal to physicians to believe that they can get good effects from drugs, if properly applied, and no longer to feel that drugs are of little benefit, and that hence any combination pleasing in colour or taste or easily swallowed will do as well as a carefully thought-out treatment.

### SENSITIZATION TO NOVOCAINE

By L. M. MULLEN,

*Central Alberta Sanatorium.*

*Calgary*

IN sanatorium practice where novocaine is used in pneumothorax refills, one would expect to note evidence of any ill effects of the anæsthetic. In our institution we use 0.75 per cent novocaine, without adrenalin. The average amount per patient each time is 2 to 3 c.c. I have noted a reaction in only one instance and know of one other in an ex-patient receiving refills elsewhere.<sup>1</sup>

#### CASE 1

Mrs. M., aged 30, Czechoslovakian, was admitted to the sanatorium on December 11, 1932. Her course was uneventful until November, 1933. At this time she had had about thirty-five refills. She stated that for two or three days after refilling on the last four or five occasions she suffered from pain and soreness in the region of the puncture. Examination after the next three refills showed erythema and induration about the site of puncture to a diameter of three or four inches. This reached its maximum about six hours after injection and gradually faded over 2 to 3 days. The temperature on the last occasion reached 100.6°. From this time on refills were given without the anæsthetic and no reaction occurred. To further show the sensitivity to the anæsthetic, I injected 0.1 c.c. intracutaneously in the arm. Erythema and induration occurred as in the chest, reaching a diameter of an inch and a quarter in a few hours with pain and soreness. This practically disappeared in 36 hours.

#### CASE 2

Miss M.P., aged 21, Scotch, was admitted to the sanatorium on June 6, 1931. Pneumothorax was started on June 30, 1931. She was discharged from the sana-

torium on September 2, 1932. While in the sanatorium she had pneumothorax refills without any disturbance. Later, a communication from the patient (November, 1933) stated that she had been having pain after each refill since December, 1932. This came on a few hours after treatment and lasted four days, being severe enough to keep her in bed. Her temperature reached 101.0° on the day of the treatment and remained elevated for three days. A personal communication from her physician confirmed her statement. Later he injected the anæsthetic subcutaneously in the chest and the same reaction occurred. As it was considered re-expansion would be safe at this time, pneumothorax was discontinued.

The formula of novocaine is  $\text{NH}_2 \text{C}_6\text{H}_4 \text{COO} \text{CH}_2 \text{CH}_2 \text{N} < \begin{smallmatrix} \text{C}_2\text{H}_5 \\ \text{C}_2\text{H}_5 \end{smallmatrix}$ . A personal communication from Professor V. E. Henderson<sup>2</sup> states that many substances containing ring forms, under certain conditions and with certain patients, lead to sensitization. In novocaine we have the benzene ring,  $\text{C}_6\text{H}_4$ .

A somewhat similar case of sensitization was reported recently by MacKay,<sup>3</sup> and in his article he suggests the possibility that various minor reactions of patients after pneumothorax refilling may be due to the anæsthetic rather than to the effects of the collapse itself.

#### REFERENCES

1. MINISH, N. J.: personal communication.
2. HENDERSON, V. E.: personal communication.
3. MACKAY, W. M.: Hypersensitivity to novocaine in artificial-pneumothorax therapy, *Am. Rev. Tuberc.*, 1935, 31: 147.

## Case Reports

### A CASE OF STRYCHNINE POISONING\*

By C. L. ANDERSON, M.D.,

*Montreal*

The first instance of the use of tribromethanol (nembutal) in strychnine poisoning was reported in 1932 by Stalberg and Davidson, and the drug was supplemented by sodium amytal. Very few such cases have been reported since.

A male, aged thirty-five, took an indefinite amount of strychnine sulphate crystals at 11 a.m., with suicidal intent. He was admitted to the out-door department at 12.30 p.m. by ambulance. The family physician had administered  $\frac{1}{4}$  gr. morphia for convulsions, which had begun one-half hour prior to admission.

On examination the patient was found to have moderately severe convulsions, aggravated by touch or noise, risus sardonius, mild opisthotonos, with hyperactive knee-jerks. The pulse was 140, the face flushed, and with suggestive circumoral pallor, with other signs of asphyxia. Sodium amytal was not available at the moment, and avertin was administered at 1.00 p.m. The dose employed was 90 mg. per kilo. of body weight, since it was feared that the respiratory depressant action of the morphia already given, combined with the avertin in maximal dose, would be too much. Ten minutes later, at 1.10 p.m., the patient was asleep, the pulse rate had fallen to 120, and manipulation of the body did not produce convulsive movements. The respirations were depressed, causing some worry, as cyanosis was increasing without obstruction to the respiratory passage. This, however, did not become alarming. The stomach was then lavaged and the material obtained later examined for strychnine, the presence of which was corroborated on isolation and injection into the lymph space of a frog. Two hours later, at 3.30 p.m., the pulse was 92, regular and of good volume; no con-

vulsions or rigidity. From then till 7.00 p.m. a few slight twitches of muscle groups were noted in the arms and legs. The patient awoke at 8.45 p.m. and vomited about 500 c.c. of watery fluid. He complained of feeling hot and stiff. At 8.50 p.m. he was given  $1\frac{1}{2}$  grs. of nembutal and was quiet till midnight. During the next two hours he had six fairly strong muscular contractions. The nembutal was repeated and no actual convulsions were noted at any time after, although he had an occasional twitch the following day. He was detained in hospital for two days for observation. The only thing of note observed was that the pulse rate fell to 48-60 the day following admission and remained there till discharge.

#### COMMENT

The treatment of strychnine poisoning, as for any poison, must do one of three things if it is to be successful: (1) remove the poison from the stomach before it is absorbed; (2) prevent the absorption of the poison by early oral administration of some substance which will in itself neutralize the poison; or (3) counteract the effects of the poison on the system, either by detoxifying the drug or by an antagonistic effect on the system affected by the poison. Since strychnine is very soluble, and therefore rapidly absorbed from the stomach, by the time the patient comes under treatment he may usually be placed in the third category.

According to Stalberg and Davidson, the great usefulness of the barbiturates in such cases, particularly sodium amytal, consists in the fact that they are anticonvulsant and detoxifying motor depressants, that they can be given intravenously in just sufficient amount to control the convulsions, and that strychnine itself is an antidote to them. Such claims cannot yet be made for avertin. It would appear that sodium amytal is a better drug to use, both because of the above statements and because with it the convulsions reappear later after the drug has worn off than with avertin.

\* From the Department of Anæsthesia of the Montreal General Hospital.

## A FOREIGN BODY IN THE EXTERNAL AUDITORY CANAL\*

BY G. E. M. HILTON,

*Montreal*

G.B., male, aged 13 years was first seen on August 28, 1934, complaining of a painful and discharging ear and was admitted to the Montreal Children's Hospital the following day.

*History and present illness.*—Four years previously the rubber end of a pencil had lodged in his right ear. He received treatment at the Western Hospital, where they were unable to remove the rubber *in toto* but took it away piecemeal. It was thought to have been totally removed, but he had always complained of that ear since that time. About 1 year ago, following a severe cold, the ear started to run and had done so steadily since. About 4 days before admission the pain and discharge increased in severity, and the mother stated that the pain was so severe at times that the boy seemed to go out of his head and talk foolishly.

*Physical examination.*—There were signs and symptoms of an acute mastoiditis. The external ear canal was blocked by a large polyp; considerable purulent discharge was coming from around the polyp. About 90 per cent loss of hearing. No fistula symptoms, nystagmus, or dizziness. X-ray showed blurred cell outlines with considerable sclerosis and the appearance of an old chronic mastoiditis.

Radical mastoidectomy was done on August 30, 1934. On opening the mastoid cortex pus under very high pressure pulsated forth in large quantities. The cells all contained pus and in many places the cell walls had broken down to form small cavities filled with pus under pressure. On removing some of the granulations protruding through the antrum a large quantity of pus gushed forth. The sinus was found exposed at about its midpoint and covered with granulations. The sinus plate was removed above and below this area and the sinus appeared to be healthy.

On completing the separation of the periotum from the posterior external auditory canal a large portion of the rubber end of a pencil was found apparently wedged into the annulus

tympanicus. In removing this the polyp being distal became detached so that its site of origin could not be located. The posterior bony canal wall was chiselled down and the bridge removed. The middle ear was found to be filled with polyps and granulation tissue. The head of the malleus, covered with granulations, was all that could be found of the ossicles. The dura was found exposed in the middle ear. There were a few granulations on it and the area around appeared healthy. Some granulations on the medial wall of the middle ear were not disturbed. A "Y" shaped flap was made and the cavity lightly packed from the external canal. The posterior wound was closed with a drain in the lower angle.

All packing and sutures were removed on September 6th. Patient has been returning to Outdoor for cauterization of the granulation tissue. There is still a slight discharge from the ear.

## A CASE OF EXTRAUTERINE PREGNANCY

BY JOHN P. BONFIELD, M.B., M.R.C.S. (LOND.),

*Ottawa*

This is a case of a young woman, aged twenty-eight, unmarried. Her history is as follows.

In April, 1934, she was admitted to hospital acutely ill with severe pains throughout her abdomen, and a feeling of nausea and faintness. This was at that time diagnosed as a case of acute salpingitis. Her red blood cells had fallen to 1,500,000. She left the hospital at the end of ten days. She was still suffering from a considerable amount of pain, particularly in her right side. From that time onward she had never been free from pain. She noticed a small tumour in the middle of the abdomen, which gradually became larger, and had reached just about two inches below the umbilicus when I saw her for the first time on November 24th, seven months later. She stated that this mass had not increased in size, but rather had become smaller in the last two months. It was extremely tender to touch. It seemed to be pulled towards the right side, and its superior surface was irregular in outline. Examination by the vagina revealed a slightly softened cervix pulled at an acute angle to the left side. The uterus

\* A case presented at the Meeting of the Section of Oto-Rhino-Laryngology of the Montreal Medico-Chirurgical Society, December 13, 1934.

could not be made out as a separate organ. The mass was tensely cystic. Examination by the rectum showed that the pouch of Douglas was completely filled by a cystic mass extending well over on both sides. Fetal parts could not be made out.

The patient's history was very indefinite. It was stated that she had one menstruation following her first admittance to hospital, seven months previously, but that after that there had been more or less continual bleeding, with an occasional apparently normal menstruation. She denied all signs and symptoms of pregnancy. Under the circumstances, a diagnosis was made of an intraligamentous cystic tumour.

On opening the abdomen the great omentum was found to be securely attached along the right border of the cystic mass. When this was separated a tense cystic mass presented itself completely surrounded by a peritoneum, which extended up from the right broad ligament. Loops of intestine were very densely adherent to this peritoneal sac. Nothing could be done until these were entirely released. The sac wall was entered posteriorly, and there was an immediate escape of a considerable amount of brownish fluid. This fluid escaped from a large brown friable mass about the size of a large grape fruit. Below this and to the left side lay a fetus, five months old. It was attached by a well-developed cord to the friable mass, which was the placenta. This placenta was easily shelled out from its peritoneal sac without hæmorrhage. There was very little hæmorrhage throughout the entire operation. No packing was inserted, but a Penrose drain was left in the remains of the sac to take care of any oozing.

The sequence of events is easy to follow now. When she was first admitted to the hospital, she had a tubal pregnancy which had ruptured into the broad ligament rather than into the abdomen, and the child continued to grow retroperitoneally. The child had probably died a few weeks before I saw the case. This would cause the cessation of all signs of pregnancy, such as enlargement of the breasts, etc.

The menstrual disorder, so inaccurately described, was the "spotting" which always occurs in extrauterine pregnancy. The enlarging tumour was the developing fetus, and the irregularity of the tumour mass was caused by

its retroperitoneal position. The placenta shelled out easily because all its vessels were thrombosed.

The patient has made an uneventful recovery up to the tenth day, but there is always the grave danger of intestinal obstruction taking place.

## TWO CASES OF TULARÆMIA

BY EDWIN K. WRIGHT, B.Sc., M.D., C.M.,

*Athabasca, Alta.*

The following cases are reported on account of the relative rarity of the disease, and also to show how the symptoms might suggest less serious conditions.

### CASE 1

Mrs. S., Ukrainian, aged 44, first consulted me on April 15, 1934, complaining of weakness, constipation and frontal headache during the preceding seven months. She gave me the following history. About September 30, 1933, she had skinned several rabbits for her dogs. Several days later she had become ill with chills, headache and abdominal discomfort. On October 5, 1933, she had been admitted to hospital. According to the hospital records, she was complaining of pain in the right chest, chills, and an infected finger of the right hand. These records also show that she had a temperature which ranged between 100 and 104°. The finger was incised and the patient discharged from hospital on October 9, 1933, with a diagnosis of acute pleurisy. From that date until April 15, 1934, when she came to me, she had had no medical attention. At that time her most outstanding symptom was extreme weakness. She was pale and looked as if she had been seriously ill recently. Examination at that time showed a series of scars, ten in number, extending from the right hand to the right anterior axillary fold. Questioning brought out the fact, that these scars were due to abscesses, which ruptured spontaneously, during the months of December, 1933, and January and February of 1934. A tentative diagnosis of tularæmia was made at the time, and the patient was to return later that day, in order that I might get a specimen of blood for the agglutination test. She did not return.

however, and I did not see her again until August 15, 1934. A specimen of blood was secured and forwarded to the Department of Bacteriology, University of Alberta. On August 22, 1934, this was reported to contain the specific agglutinin for *B. tularensis*.

#### CASE 2

F.W., male, aged 16, consulted me on November 26, 1934, complaining of extreme weakness, anorexia, frontal headache, vague abdominal pains, and a painful swelling in the right axillary space. He was pale, and his appearance suggested that he was recovering from a severe illness. He gave me the following history. About October 20, 1934, he had handled and skinned a rabbit. On October 25, 1934, he be-

came ill with chills and fever, abdominal discomfort, weakness, and frontal headache. Several days after this onset, he discovered a small collection of pus under a finger-nail of the right hand, and at the same time found a small lump in the right axillary space. He was treated at home without any improvement, until he was brought to me on November 26, 1934. I admitted him to hospital as a case of tularæmia. The axillary abscess was drained, and two days later the patient was much improved. The systemic reaction had subsided and he stated that he felt almost normal. A specimen of blood was sent to the Department of Bacteriology, University of Alberta, and on December 5, 1934 this was reported to contain the specific agglutinin for *B. tularensis*.

## Editorial

### PROSTIGMINE IN MYASTHENIA GRAVIS

MYASTHENIA gravis has always been looked upon as a "hopeful" disease. Its lability, its apparent response to various forms of treatment, and the absence of any profound structural change in the body have led to the view that there would someday be a complete remedy. This view has been strengthened of late by a fuller understanding of the chemical transmission of nerve impulses. Recognizing the similarity between the symptoms of myasthenia gravis and curare poisoning, Dr. Mary Walker, of St. Alfege's Hospital, Greenwich, was led to employ physostigmine in a case of this disease in the hope that it "would counteract the effect of the unknown substance which might be exerting a curare-like effect on the myoneural junctions". There was marked improvement, but because of severe gastrointestinal symptoms following injection of the drug the analogue prostigmine was later employed.

There are now a sufficient number of reports to allow of some appraisal of the effect of prostigmine in myasthenia gravis. There is general agreement that following the intramuscular injection of 2 to 4 c.c. of the drug a very considerable improvement of muscle power occurs. The effects become

evident in twenty minutes, are at their height in about one hour, and persist for about five hours. The improvement in facial mobility, ptosis of the eyelids, and strength of the jaw muscles is apparent to the observer, and ergometric tracings recorded from the limbs provide corroborative graphic evidence. The patient himself finds that talking and swallowing are improved, and frequently states that he feels "normal". There are often, however, marked nervousness and apprehension, gastro-intestinal unrest, and annoying twitchings in muscles not predominately affected by the myasthenia.

There are sound physiological reasons why prostigmine might be effective in such a disease as myasthenia gravis. The work of Dale and his associates has shown that effective nervous impulses are mediated by the liberation of acetylcholine at the myoneural junction. Prostigmine is an antagonist to the esterase which normally destroys free acetylcholine in the body. It is theoretically possible that an aberration of the normal chemical transmission of nervous impulses might obtain in myasthenia gravis. This has not been proved, however. Experience with prostigmine has revealed a number of discomfiting facts which do not

however negate the theoretical importance of the discovery. The drug is expensive. The maximum duration of its effect is about 5 hours, and its exhibition is sometimes followed by an alarming period of relapse which suggests the "whipping of a tired horse". The associated muscular twitching and gastro-intestinal distress are occasionally severe, despite the additional administration of atropine. The limited movements of the eyeballs are seldom improved, even when there has been great improvement of muscular power elsewhere. Attempts to provide continuous dosage by administration of physostigmine and belladonna per os have been poorly tolerated by the patients.

Further, it has been found that considerable temporary improvement may occur in patients suffering from a variety of diseases, *e.g.*, progressive muscular atrophy, nerve injuries, etc., in which there is definite neuronc degeneration. This latter fact would go to show that the action of prostigmine may not be specific for myasthenia gravis but may be dependent upon stimulation of remaining intact neurones.

There can be no doubt of the importance of this new discovery. Its successful application, however, would appear to depend upon a fuller knowledge of the chemical and physiological mechanisms involved.

DONALD MCEACHERN.

### ARTERIOSCLEROSIS AND DIABETES

WHY are diabetics prone to develop arteriosclerosis so rapidly and extensively? The problem is well stated in a recent paper from the Diabetic Clinic of the Montreal General Hospital,\* which also contains some noteworthy observations on its large group of patients. There is no question about the frequency and early appearance of arteriosclerosis in the diabetic. All records go to prove it, none more convincingly than those of the General Hospital Clinic. In a group of 500 of its diabetics of all ages the percentage of those with sclerosis was 62.6, and even in those of 50 and under it was 47.7. Shields Warren, in a group of 108 autopsies of diabetics, found arteriosclerosis in 65.7 per cent.

It might be suggested that most elderly people who have had diabetes long enough would be likely to have vascular disease. But further study of the General Hospital material shows that in over 80 per cent of all its cases, five years' duration is long enough to cause the sclerosis. Warren's experience is summed up even more forcibly; he says, "I have yet to see at autopsy a diabetic, or to read a protocol of a diabetic, whose disease has lasted five years or more, free from arteriosclerosis, regardless of age."

It is believed by many that an important causative factor in the matter is the increased blood cholesterol usually associated

with diabetes. The evidence for this view, which is supplied by pathological and chemical studies as well as by experimental studies on animals, is abundant. But suggestive and attractive as it is it still has its obscurities. Cholesterol itself is not a simple substance, and its name is apt to be invoked with more familiarity than our knowledge of its behaviour warrants. What is the precise connection between excess of blood cholesterol and vascular disease? Why do not all who eat fatty-rich meals develop sclerosis? Why is it that xanthoma can exist, presenting a very high cholesterol content of the blood, but no unusual degree of sclerosis? These questions have yet to be answered, but there is no doubt of what has been accomplished in Dr. Rabinowitch's clinic. In a word, he shows that the incidence of vascular disease in his group of diabetics has notably decreased in the last five years. His conclusions are based especially on what has been learnt from a group of 50 diabetics. These were all carefully selected to establish their freedom from arteriosclerosis at the beginning of their treatment for diabetes. Their average age was 43.8 years, and the minimum duration of their diabetes was 5.6 years. At the end of five years it was found that 14 only had developed sclerosis, that is, 28 per cent, as against the much higher rate already noted as being usual in all diabetics of five years' standing. This improvement is associated with the use of

\*Arteriosclerosis in Diabetes, by I. M. Rabinowitch, *Ann. Int. Med.*, 1935, 8: 1436.

the now well-established high-carbohydrate low-fat diet. One of the striking effects of this diet is an immediate and sustained decrease in the proportion of cholesterol in the blood, and this was thoroughly demonstrated in this group.

We draw attention to this study as an instance of what can be accomplished by

careful, prolonged observation of large groups of patients treated by uniform methods. A longer period must be allowed to elapse before the full effect of this diet in checking vascular disease can be properly estimated, but so far the work done at the Montreal General Hospital gives promise of most encouraging results.

H. E. M.

## Editorial Comments

### Pleural Poudrage

Pleural adhesions are more often than not a distinct and often insuperable difficulty in the production of artificial pneumothorax, and to that extent interfere with the intended immobilization of the lung by collapse. Indeed, it is difficult to think of any part of the body in which adhesions do not tend to become a nuisance. It is interesting, therefore, to find the surgeon deliberately producing pleural adhesions as an aid in his work. This is done as a preliminary step in lobectomy, since it has been found that successful removal of one lobe is largely dependent on the fixation or anchoring of the other lobe or lobes. But the technique of producing these adhesions is no simple matter. Adhesions form naturally on very little provocation, apparently, but to produce them artificially and in limited areas only is not done with uniform success. Dr. Norman Bethune now adds\* another device to the many already used, which have included such methods as packing gauze, etc., against the pleura, irritation of the pleura with various chemicals, stitching the lung to the chest, introduction of elastic bands, silver wire, or tape, etc. His idea has been to find a pleural irritant which (a) could be applied without opening the chest; (b) would penetrate the crevasses of the pleura; (c) would not depend on posture for its action; (d) would be non-absorbable by the body generally; (e) would set up enough irritation to produce adhesions and no more.

On experiment he has found that these requirements are best fulfilled by a silicate powder (commercial talc) which can be blown in on selected areas (guided by a thoracoscope), the lung being first collapsed, and then immediately after the dusting the air is withdrawn so as to bring the lung back against the wall. Dr. Bethune reports four cases in which the method was successfully employed, and with no undesirable after-effects.

H.E.M.

\* Pleural poudrage, by Norman Bethune, *J. Thoracic Surg.*, 1935, 4: 251.

### The Tercentenary of Robert Hooke

It is always interesting and often improving to remember the anniversaries of great men. Probably few in this age have heard of Robert Hooke, yet we are enjoying not a few benefits that can be traced back to his creative and inspiring genius. Indeed, for sheer versatility and range of imagination Hooke almost deserves to be classed with those giants of the preceding century—Leonardo da Vinci and Girolamo Fracastoro.

Robert Hooke was born on July 18, 1635, the son of a parish minister. Displaying a predilection for science, he became an assistant to the Hon. Robert Boyle, the outstanding chemist and philosopher of the time. Like another scientist who developed a talent for architecture, Sir Christopher Wren, who was a professor of astronomy, Hooke submitted a plan for the reconstruction of the city of London after the Great Fire, and though Wren's ideas were finally adopted Hooke's plan was so much admired that he eventually made quite a fortune as a surveyor and builder.

Hooke was early appointed curator of the Royal Society, his special duty being to perform experiments, and so extraordinary was his mental capacity that for several years he was able to demonstrate new discoveries at almost every meeting. He has been termed "The Father of Microscopy". His *Micrographia* (1665) contained the first histological description of the structure of plants, and was embellished by fine illustrations. This work probably inspired Nehemiah Grew, also of the Royal Society, to produce his studies on vegetable histology and physiology (1671, 1682). It is said that we owe the concept and the term "cell" to Hooke. In 1667 Hooke, repeating an experiment of Vesalius', opened the thorax of a dog, and by blowing a bellows briskly over the lung showed that it was possible to keep the animal alive without any movement of the chest or lungs. This proved that the essential feature in respiration lies not in movement but in certain

blood changes in the lungs. Further, as Dr. Victor Robinson says of him, "He was a wizard in mechanics, and his inventions in flying machines, air-pumps, watches, microscopes, telescopes and meteorological instruments were almost countless. With equal ease and ingenuity he could speculate on the movements of the heavenly bodies, and make experiments with a bubble of soap and water."

Hooke had a crooked, dwarfed and ungainly figure, and he had a warped mind. He is said to have been miserly, crabbed, jealous, vain, and morbid. May we put this down, charitably, to eccentricity of genius? Not only did he make about half of the discoveries of his age but he laid claim to the other half! When Newton was preparing his *Principia* Hooke accused him of stealing some of the ideas from him. Accordingly, Newton determined to suppress about one-third of the work and was with difficulty dissuaded from his purpose. Later, when Newton had completed his *Optics* he found that Hooke had claims against this also, and so he kept his work in manuscript until Hooke was dead. In the Royal Society Hooke was certainly a disturber of the peace!

Dr. R. T. Gunther, of Magdalen College, Oxford, writing to *The Times* recently, emphasizes in striking fashion the indebtedness of our age to Hooke, whom he proposes to dub "The Father of the Industrial Age". He says: "It was his air-pump, made in the Oxford High

Street, that was the prototype of the atmospheric engine of Newcomen, which in its turn was the progenitor of the steam-engines of Watt and Stephenson, and of all that they produced. The principal outcome has been speed—speed of travel and transport, speed of production, speed of manufacture. And speed, rightly used, means leisure for civilization. But Hooke's great work went further. His basic inventions have also made speed safe; for to him we owe means for the accurate measurement of weather, time, and longitude. His anchor-escapement brought about a revolution in clock making; his balance-spring, still living in our wrist-watches, yielded chronometers which have given the sailor such sure knowledge of his position that he can now approach unseen land at speed and without risk. Hooke's discovery of the Law of Springiness, *ut tensio si vis*, forms the basis of the theory of elasticity used by engineers in every form of design. Hooke's Joint is an essential link of the transmission gear of many cars; and many other instance might be quoted of the benefits to civilization which have had their origin in the fertile, restless brain of this three-hundred-year-old Father of the Industrial Age."

We owe much to Robert Hooke. There have been few in his class. Despite serious defects in character, which may, after all, have been the result of ill health and rebellion against his physical deformity, he was a great man, and seems secure of his place among the Immortals. A.G.N.

## Retrospect

### THE ASTHMA RESEARCH COUNCIL: REPORT OF PROGRESS FOR YEAR ENDED OCTOBER 31, 1934

BY T. G. HEATON,  
*Toronto*

At Guy's Hospital analysis of 500 case histories by Dr. L. J. Witts showed that the most striking differences between the asthmatic and the normal person were the high incidence of protein hypersensitivity and the frequency of lesions in the upper and lower respiratory tract. Treatment has been directed to attacking the lesions of the respiratory tract by respiratory exercises, inhalations, vaccines, operations, etc., while the protein hypersensitiveness has been dealt with by the avoidance of harmful agents, and by attempts at specific or non-specific desensitization.

Experiments have proved the superiority of the intradermal over the scratch technique. Positive skin reactions occur in normal people. What is pathological is the persistence of hypersensitiveness in an exaggerated degree. The

appearance of increased numbers of eosinophiles in the circulating blood is one of the most constant features of allergic asthma. The treatment of vasomotor rhinitis and paroxysmal rhinorrhœa should always be along allergic lines and relief can be obtained within a short period in the majority of cases.

Hay fever sufferers are more sensitive to other allergens during their pollen season than at other times, and should be treated with these substances as well as with pollen. Psychic stimuli are important in lowering the threshold of the attack. Asthma tends to occur most often among children who are over-protected and fussed about by their parents. The general tendency of asthmatics who seek medical advice is to improve, whatever the treatment prescribed. At St. Mary's Hospital a sufficiently large dosage of pollen to abolish the skin test is aimed at, and this necessitates a large number of inoculations. Certain patients have been given treatment sets for self-administration with satisfactory results.

Experiments by Dr. Harley suggest that the state of sensitiveness to bacteria is not induced

by the immunizing antigen but by some other bacterial fraction. At Leeds General Infirmary intramuscular injections of liver extract at frequent intervals have been found helpful in the treatment of asthma. At King's College experiments on the action of adrenaline have shown it to cause a large increase in the blood potassium of animals. The source of the increased blood potassium was shown to be the liver. "In view of the great importance of potassium in relaxation of the bronchi it seems

scarcely possible that this great release of potassium is without significance in the relief of asthma produced by adrenaline." Potassium salts have been found to be of no clinical assistance, however. Dr. J. W. Thornton, working at Bristol, found that acetylcholine is liberated in isolated lungs at vagus nerve endings when the nerve is stimulated electrically. This is the substance responsible *in vivo* for the transmission of the stimulus that causes bronchial spasm.

## Special Articles

### THE LICENSING OF SPECIALISTS

By G. STEWART CAMERON,

*Peterborough*

Some two years ago there appeared in this *Journal*,\* an article by Dr. Stanley Ryerson, Secretary of the Faculty of Medicine, University of Toronto, setting forth his views on what course the profession should take in the matter of granting licenses to those who wish to do special practice. Any statement coming from this source is always worthy of consideration by the Canadian profession. The plan proposed by him is simplicity itself. The suggestion is made that the powers of the Dominion Medical Council should be extended, to include the examination of those who desired to secure a certificate that would entitle them to be called "specialists" in that particular division of medicine in which they desired to specialize. In addition to this examination, certain requirements in the way of post-graduate studies and hospital experiences would be required. This is quite clear to everyone, and if this was all that need be considered there is no apparent reason why the proposal should not be adopted.

I take it the word "specialist" conveys the same meaning as the term "consultant", in my opinion, a more acceptable term. In discussing this phase of medical practice with other members of the profession in different parts of Canada, one recognizes that there is a dual problem in the minds of many. The elimination of the spurious specialist is one, and the recognition of a well defined standard of education for all who desire to practise as consultants is another. As the problems differ widely, so do the solutions. The one concerns the moral standard of the profession, while the other is an educational matter. A brief glance at the history of Canadian Medicine during the past fifty years will indicate the reason for these present-day difficulties. Fifty years ago, there were none, or at all events very few, who did

special practice. Today, particularly in our large centres, we have many experts in every division of medicine. This change has been brought about, of course, by unparalleled research in the whole domain of medicine, and the successful application of the results in clinical fields. At no time in history have so many discoveries been made that have a direct bearing upon the health of mankind as in the last few decades. Besides bringing into the profession of medicine large numbers of men who have become especially competent in their work and ethical in their practice, these remarkable changes have attracted others whose chief desire has been to exploit these splendid achievements. They interpret the practice of medicine in commercial terms, wholly indifferent to the humanitarianism upon which all successful practice is built. Will examinations and the granting of diplomas to the successful candidates prevent the activity of this undesirable class? I very much doubt it. Those guilty of such practices are not found in the medical profession alone. They are the representatives in medicine of that class of society which is willing to exploit anything that offers a prospect of gain. They are found in industry, in finance, and in all the other walks of life.

I suggest that the solution of this first problem is to be found in a careful consideration of the background of those who seek to enter the profession. Academic standing is only one requirement by which applicants should be judged. I believe that the profession and those responsible for the education of the medical student of the future will require to give more attention to the moral character of those into whose hands will be committed the lives, the health, and much of the happiness of our people. Fewer students in our universities, and closer personal contact with their teachers, should lead to a more thorough weeding out of the undesirable and of those who lack the essential qualities of heart and head so necessary in our calling.

\* 1933, 29: 72.

The second and larger question is: By what standard shall we judge our consultants or our specialists? Our answer to this question will have far-reaching effects in the years to come. The experience of the well-equipped general practitioner is that in a small percentage of his cases he requires help beyond that which he is able to render himself. To get this help, he should be able to turn to a consultant within a reasonable radius. This consultant should be one whose attainments in his profession are recognized alike by his colleagues and the public. It is not necessary that many men highly trained in the small divisions of medicine should be everywhere available, nor is it to be supposed that every patient requiring the assistance of a specialist should be sent long distances to secure that help. Our population is too small to support a multiplicity of experts today and will be for many years to come. In saying this, I do not wish it to be understood that highly developed consulting service is unnecessary. On the contrary, in centres of population where large hospitals are located it is very desirable, particularly for the treatment of obscure diseases and for purposes of research, both in the laboratory and in the clinical field. This, however, is quite a different picture from that of the scores and hundreds of practitioners scattered all over Canada, who require the very best consulting service within reasonable distances. To clarify my meaning I would say that the highly trained, experienced, general surgeon is and will be a greater help to the general practitioner and his patients than several men indifferently trained, representing various divisions of general surgery, would be. The same applies in the other departments of medicine.

We should not be content with halfway measures in sponsoring our specialists. They should be what they purport to be, or else stay where they belong, in the ranks of the general practitioners. The countenancing of a large body of doctors with indifferent training is in my opinion a backward step which will only complicate and postpone the solution of the problem.

In Dr. Ryerson's article the statement is made that 35 per cent of the profession are specialists. If this is correct, then there is something wrong with the educational system of a profession that produces one specialist for every two doctors. Either we are over-specialized or our general practitioners are under-specialized, in the biggest of all specialties, that of general practice. On this basis 25 per cent of the medical field is all that is left for the specialists, and yet they represent 35 per cent of the profession. Is there not a disproportion here? Can the general profession and the general public support this number of

special men? Before we provide a means of licensing these we should give much thought to the actual requirements of the public and the profession, so as to avoid, if possible, increasing the present competition, with its attendant distress and possible irregularities.

I would suggest that the Canadian Medical Association secure the opinion of the general profession regarding the problem. I may be considered heretical in suggesting that the same body could do worse than enquire what the public thinks about it, because it is just as well to remember that as the years go by the general public are going to take a much larger interest in health matters. The viewpoint of groups of thoughtful laymen in different walks of life could be helpful.

In pondering this matter, it is helpful to turn to Great Britain for information. There, apparently, some of these problems have been solved. Through the gradual evolution of practice the public has learned to distinguish a surgeon from a physician or a general practitioner. One seldom encroaches upon the field of the other. The surgeon practises his surgery, and the physician devotes his time to medicine, but each may restrict his work to some special department. I think I am correct in saying that in the British Isles stress is placed upon a broad foundation in the medical sciences, well and truly laid. While this general education is progressing, a man's aptitudes are gradually brought to light, and almost unconsciously on his part he finds himself following with renewed enthusiasm some particular path in medicine. To mark his scholarship, he proceeds to one of the well-known examinations, the passing of which entitles him to the use of a certain degree. In passing, it might be well to notice that these examinations are general, but very thorough in their conception. They pre-suppose the widest possible knowledge in the subjects required by the curriculum. Subsequently the candidate may restrict his practice in any manner that he chooses. Probably the best known of these degrees is the Fellowship. A man possessing the Fellowship of London, Dublin, or Edinburgh, is known to be well trained. His standing is accepted by the profession without question, and the public from long years of experience accords him a rightful place in the care of the sick. In addition, many of the public services of Great Britain are open only to men possessing these qualifications. To secure an appointment on the staff of many of the hospitals, particularly the larger ones, the applicant must have the standing of a Fellow of one of the Royal Colleges.

I have dwelt on this at some length because we are at the parting of the ways. We can

easily drift into arbitrary and provincial methods in endeavouring to correct our present position, or we can take the liberal attitude that scholarship must be the determining factor. In Canada we have no established measuring rod, as they have in Great Britain, but we have the recently organized Royal College of Physicians and Surgeons of Canada, and it is the sincere hope of many that the College should come to be recognized by Canadians in the same way that its British prototypes are by the people of Great Britain.

One portal of entry to the practice of medicine has been insisted upon, namely, that of scholarship. Can we not carry this a step farther and agree to accept the examinations of the Royal Canadian College as the broad base upon which all consulting practice should stand. I know I am suggesting something that will not receive unanimous support. I believe, however, that the members of our profession are big enough to forget the difficulties that necessarily surrounded the development of the College, and that they will look to the future with the full assurance that the standard of scholarship required and maintained by the Royal College will secure to the profession and to the public in Canada the highest type of specialist.

It is well to remember that the Dominion Medical Council was organized to provide a uniform standard of examination for licentiates in medicine throughout Canada and in doing so deals with the young man or woman who has just emerged from the ranks of the undergraduate. The Royal College, on the other hand, was provided to give to graduates of some years' standing and of advanced training a degree that would indicate to the profession and to the public their high attainment, and at the same

time be a justification for them in offering their services as consultants.

I have heard the argument advanced that the time in securing the Fellowship is too great in many instances. There is no royal road by which one becomes a specialist in medicine, any more than there is in any other walk of life. To know the fundamentals of scientific medicine and to acquire the clinical experience that should be possessed by a consultant much time must be spent. The expense is another reason advanced against adopting the standard of the Fellowship. To me this is not a very convincing argument. The qualifications finally accepted by the profession as being necessary should be fixed without any reference to the cost of obtaining them. Any deviation from this will open the door to expedients and double standards that will be confusing alike to the public and to the profession. The urgency for reform is not so great as to require us to accept a standard a little better than that of the graduate. If there are promising men who from time to time show unusual aptitude, but are unable to continue their education because of the lack of funds, then let the profession consider providing Fellowships for these students, and in this way assist them in obtaining the goal of their ambition. My experience has been that if a man is made of the right material he will find a way of getting to the place he desires to reach.

In concluding this personal expression of opinion, may I add that all we can do is to make our contribution, big or little as the case may be, to the general plan. We are not called upon to complete the scheme, but we are asked to make sure that our part will be the best our experience can suggest, and that it will in the most acceptable manner assist future developments of our profession.

**SEA-SICKNESS.**—After describing the symptoms and the previous theories of sea-sickness P. Cazamian gives his own views. Sea-sickness results from the effect of a multiplicity of afferent impulses, arising in the viscera as well as in the external sensory organs. These stimuli produce excessive secretion of adrenaline with a resultant sympathetic "storm". This is followed by compensatory over-stimulation of the vagus. According to the response to the oculo-cardiac reflex, in which the pulse rate is altered after pressure on the eyeballs, three types of individuals are distinguished: one, the vagotonic, in which the pulse rate is markedly slower; another, the sympathetictonic, in which the pulse rate is increased; and a third, the amphotonic, in which it is only slightly reduced. The sympathetictonics are the most likely to develop sea-sickness. Prophylaxis depends on breaking the reflex arc, ideally by paralyzing the sympathetic trunk. In 1917, when the author began his experiments, no drug acting directly on the sym-

pathetic was known, so he used atropine sulphate, which inhibits the vagus, and hoped to obtain compensatory inhibition of the sympathetic. The results were satisfactory. Since then the neutral tartrate of ergotamine, a substance which acts directly on the sympathetic, has been prepared under the trade name of "gynergene", and thus gives still better results in the sympathetictonics. The vagotonics respond best to atropine sulphate, while the amphotonics may require either or both. Treatment should never be necessary, but, if prophylaxis has been neglected, it follows the same lines in the early stages of sea-sickness. Later on the excretion of adrenaline fails, the sympathetic becomes fatigued and fails to transmit stimuli. This is followed by diminished vagus tone, though not to such an extent that symptoms of vagal stimulation predominate. To paralyze the sympathetic now is obviously useless, and treatment consists in giving stimulants to the sympathetic or vagus, or both, as may be required.—*J. de Méd. de Bordeaux*, 1935, p. 143.

## Medical Economics

### THE RURAL MUNICIPALITY ACT IN SASKATCHEWAN

The joint special legislative committee which was appointed at the last annual meeting of the Saskatchewan Medical Association, consisting of three members appointed by the Council of the College of the Physicians and Surgeons and three members appointed by the directors of the Saskatchewan Medical Association, has worked hard during the year. On several occasions they met the members of the cabinet and also committees of the Legislature. Finally they have succeeded in having important amendments passed to the Rural Municipality Act.

Medical attendance and treatment have been defined. There has always been a question when lawsuits to recover payment from the municipalities have arisen as to whether the obligation of the rural municipal council was to the patient or to the doctor. The amendment states that "the Council shall pay the medical practitioner". Disputes have often arisen as to the definition of an indigent. Provision has been made for an arbitration committee to define who is an indigent.

An agreement was arrived at between the medical profession and the Association of Rural Municipalities, saying that accounts for medical services to indigents will be paid on a 50 per cent basis of the schedule of fees of the College of Physicians and Surgeons of Saskatchewan. Councils which refuse to accept the obligation under the Act are to be reported to the Registrar.

At the last session of the Saskatchewan Legislature changes were made in the Rural Municipality Act as follows:—

(1) The Council of every municipality shall make due provision for the care and treatment of any indigent person who has been a resident of the municipality for at least thirty days who falls ill and requires medical attendance and treatment. For the purpose of this section the expression, "medical attendance and treatment" shall be deemed to include medical, surgical and obstetrical attendance and treatment. For the services rendered pursuant to this section the Council shall pay the medical practitioner.

(2) If any dispute arises as to whether a person is an indigent person, the expression "indigent person" shall mean any person who may be deemed or declared to be such under the following provisions of this section.

(a) In the case of a dispute the question shall be referred to two persons, either at the instance of the Council or the medical practitioner, one of such persons to be appointed by the Council and the other by the Medical Practitioner. If the Council fails to make such appointment within sixty days from the date upon which the dispute arises then the person shall be deemed to be an indigent person for the purpose of this section.

(b) If the persons to whom the question is referred fail to agree, they shall appoint a third person who shall act with them for the purpose of

deciding the question, and their decision shall be final and binding upon the municipality and the medical practitioner. If such persons fail to make such appointment, the party at whose instance the question was referred shall notify the Minister, who shall appoint an arbitrator, and such arbitrator shall, along with such persons, constitute an Arbitration Committee for the purpose of deciding the question.

(c) The Committee may require the attendance and take the testimony of such persons as it thinks fit to summon, and any member thereof may administer oaths, affirmations and declarations.

(d) The decision of the Committee shall be final and binding upon the Municipality and the medical practitioner.

(3) All provisions for medical care and treatment of indigent persons shall be made by means of a written order. Such written order shall not be required in respect of medical attendance and treatment or medicines given by a medical practitioner at a first visit or any other necessary treatment during the emergency if the medical practitioner concerned certifies that the case was, or that he was informed that the case was, one of sudden and urgent necessity.

(4) A Council shall delegate its duties under this section to a Committee consisting of one or more of its members, and may authorize each member of such Committee to issue the written orders mentioned in subsection (8).

(5) A medical practitioner who attends an indigent person on a written order made under subsection (3), or, in case of an emergency, without such order, shall within fifteen days after his first visit notify the Secretary of the Municipality that medical attendance and treatment is being given, and that he will claim from the municipality compensation for such attendance and treatment. The Secretary of the Municipality shall, within sixty days after the receipt by him of such notice, notify the medical practitioner that the council admits the claim or denies liability, as the case may be; and if such notification is not given by the Secretary within the said period the Council shall be deemed to have admitted the claim and shall pay the compensation claimed.

LILLIAN A. CHASE

### PROPOSED SURVEY OF RELIEF MEDICAL SERVICES IN WINNIPEG

Since February 28, 1934, a plan for supplying medical services to the unemployed on relief has been in operation in the City of Winnipeg. The average number of these has been about 34,000, and a relatively large mass of records has been accumulated. It was felt that a study of these records might provide information which would have an important bearing on the question of provincial or federal Health Insurance. It is acknowledged that the group is too limited and the period too short to enable actuaries to give an accurate estimate of the cost, etc., of providing health insurance for a diversified population, but it is believed that a cross-analysis of the complete medical history of a body of people of this magnitude will be of inestimable value. The opportunity for this

analysis is unique in Winnipeg, as, for sometime past, each person receiving medical attention of any kind must be fully reported upon by the attending physician or surgeon. If a similar survey could be carried out in other areas, and on different categories of the population, governments and the professions would be on much safer ground in approaching the question of health insurance. A large amount of material is now available, which, when properly sifted, will yield valuable information regarding the incidence of disease in a section of an urban population.

Through the financial assistance of the Department of Health of the Province of Manitoba the services of Dr. M. R. Elliott, who has just completed the Public Health course in the University of Toronto, have been secured for the purpose of conducting the survey. The Unemployment Relief Department of the City of Winnipeg has very courteously placed its files at the disposal of Dr. Elliott, and has also provided accommodation for him. Bearing in mind the possibility of future discussion concerning Public Health insurance schemes, with the attendant medical costs, and with a view to obtaining the greatest amount of information from the material at hand, the following plan has been outlined as a basis for the investigation.

The cases are primarily divided into three distinct groups:— (1) Medical. (2) Surgical. (3) Obstetrical.

Each of these groups will be analyzed under the following headings:

1. General Morbidity Rate from all causes.
2. Birth Rate in this class compared to general population.
3. Morbidity Rate due to Specific Diseases.
4. Age Incidence of Specific Diseases.
5. Average length of illness per person.
6. Average length of illness per Disease.
7. Average total cost of illness per person and per disease.
8. Average length of hospitalization per person and per disease.
9. Average cost of hospitalization per person and disease.
10. Total and average amount of surgery, major and minor, with costs.
11. Costs of special services, such as x-ray, blood examinations, basal metabolism, etc.
12. Number, Nature and Costs of Consultations.
13. Maternal Mortality Rate, as compared to general population, and in hospitalized cases compared to home cases.
14. A comparison of pathological reports with pre-operative diagnosis.

While it is admittedly true that this group represents a special class, and that the data obtained will not necessarily apply to all groups of people living under entirely different surroundings, yet it is hoped that this investigation will form a valuable basis for future studies,

#### 1. MEDICAL CASES

No.	Name	Age	Sex	Doctor	Diagnosis	Number of calls		Length of Illness
						Home	Office	
Consultants		Special Examinations			Doctor's Fee		Total Costs	Remarks
Name	Cost				Home	Office		

#### 2. SURGICAL CASES

No.	Name	Age	Sex	Doctor	Diagnosis	Surgeon	Operation Performed	
							Minor	Major
Hospital	Hospital Costs	Surgeon's Fee	Physician's Fee	Total Costs	Pathological Reports	Remarks		
Days in								

#### 3. OBSTETRICAL CASES

No.	Name	Age	Doctor	Diagnosis	Hospital (if any)	Days in Hospital	Hospital Costs inc. spec. services
Consultations		Doctors' Fees		Children Born		Stillbirths Maternal Deaths	Total Costs
Name	Costs	Home or Hospital		M.	F.		

With the above information once tabulated, it will be possible to gain the following information:—

and that information of vital value to the medical profession and to the community as a whole will result.

E. S. MOORHEAD

### PAYMENT FOR MEDICAL SERVICES TO INDIGENTS IN REGINA

When the newly elected Regina city councilors were going over doctors' bills for services rendered to city relief patients one of them remarked that the bills were too high and that the doctors were "racketeers". There is nothing like a good hearty insult to bind the medical profession together. In 1934 the doctors in Regina were paid \$35,000, the hospitals \$47,000 and the druggists \$10,000 for services rendered to relief patients, which is about \$8 per person for every man, woman and child on relief. Clothing for relief recipients cost \$100,000. The total amount spent on relief by Regina was \$1,100,000. Many meetings of the Regina and District Medical Society were held. A committee of the medical society met with a committee of the city council many times. Finally the following scheme was decided to be mutually agreeable. The city will pay attending physicians for attendance on relief patients: (a) in the patient's home, 50 per cent of the ordinary fee and specialist's fee; (b) in hospital, only acute cases, 50 cents a visit; (c) for operations: no charge for a surgical case shall exceed \$50; the schedule for surgical charges shall be left to the medical advisory committee, who shall arrange these according to the seriousness of the case and the time involved; (d) maternity cases, at hospital, whether normal or abnormal, \$10, at home, \$20.

The physicians attending families or persons on relief shall submit before the tenth of each month a separate properly itemized account, with diagnosis, covering medical services rendered during the month previous. A card will be supplied to all patients on relief, bearing

the name of the recipient, upon which shall be entered by the attending physician, the diagnosis, date of service, and signature, covering each attendance, whether in the home or at his office.

In prescribing drugs the Canadian Formulary or B.P. shall be followed whenever possible, with a view to further economies through the elimination of costly proprieties.

A medical advisory committee of three shall be appointed by the Regina and District Medical Society to confer with Dr. Coles, the medical health officer, on relief problems. The city is prepared to give 5 per cent of the total amount paid out for medical relief work each month to the advisory committee for their services.

The committee shall cooperate with the medical health officer: (a) in making relief medical services economical and efficient, with a view to preventing the recurrence of adverse criticism; (b) they shall have authority at their discretion to name a suitable consultant in any relief case considered surgical before proceeding with the operation; (c) to certify to all medical accounts covering relief cases each month, if so requested by the city council; (d) to report monthly to the executive committee upon services rendered; (e) to recommend to physicians attending relief cases not to proceed with any surgical measure not immediately urgent until opportunity has been afforded by the medical health officer or medical advisory committee to grant the necessary consent.

Complaints of members concerning the operation of this agreement shall be made in writing and addressed to the secretary of the executive committee for consideration.

This arrangement shall be subject to revision three months after date of going into effect.

LILLIAN A. CHASE

## Men and Books

### THE ACQUISITION OF SHAKESPEARE'S MEDICAL AND PSYCHO-PATHOLOGICAL KNOWLEDGE

BY IRVING I. EDGAR, M.A., M.D.,

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Shakespeare's dramas contain what seems to us today a vast amount of medical material. Because of this he has been credited with an unusual amount of medical knowledge. In fact, the Shakespearean idolators have gone so far as to make of him a "master of medicine", a "physiologist", a "neuropsychiatrist", a "great physician", etc., and they have attributed to him scientific knowledge which only later generations could possibly have had. The reason for this is that the medical commentators have failed to take into consideration the age in which the

dramatist lived, and have interpreted him on the basis of modern standards. The result, of course, has been a grand travesty of logic, which has led to foolish extravagances in respect to the poet, utterly beyond the pale of reason. Surely these commentators should have known the importance of environment in life. They should have attached proper significance to the historical background in which Shakespeare moved.

Now, in the first place, it has been proved<sup>1</sup> that medical knowledge was much more widely diffused among laymen in Shakespeare's day than it is today. Such medical knowledge consisted mainly of Aristotelian and Galenic teachings brought into the limelight by the Renaissance. It was possible for an intelligent layman like Shakespeare to acquire an acquaintance with it. Secondly, since the Elizabethans had no newspapers or periodicals, the Elizabethan

stage assumed, more or less, the functions of these. The stage was undoubtedly an avenue for the dissemination of all kinds of knowledge, political, social, economic, medical. Not only are Shakespeare's dramas full of medical matter, as most of the medical commentators seem to infer, but the dramas of practically all of Shakespeare's contemporaries are full of medical references.

But, aside from all this, Shakespeare had ample opportunity to acquire the medical knowledge that he shows. The fact that Shakespeare's son-in-law was a doctor certainly contributed to his interest in the subject. And "it is not unreasonable to suppose," as Dr. Hawley points out (1892), "that he had become acquainted with the theories of the older medical writers through conversations with his son-in-law, the physician of Stratford, Dr. John Hall," and that some of his wealth of clinical observation may be attributed to this close association."<sup>2</sup> Dr. Bucknill (1859), earlier than Dr. Hawley, also felt that it was "scarcely possible but that some influence should have been exercised upon the impressionable mind of the poet, by the husband of his favourite daughter, living with him in the same house,"<sup>3</sup> while Dr. Donnellan, at a later date (1902) agreed with both: "It is reasonable to suppose he was assisted in his researches by his son-in-law, Dr. Hall . . ."<sup>4</sup> However, be that as it may, we must not lose sight of the fact that Dr. Hall married Susannah Shakespeare in 1607, that is, at a time when Shakespeare had completed most of his work. Dr. Hall's influence upon Shakespeare, therefore, in the matter of medical knowledge, must have been very little if any.

In addition, Shakespeare's supposed medical knowledge might have been derived from books of a medical character. Dr. Hackman says "That he was possessed of such knowledge as could be gained by reading the available anatomical treatises of the period is proved."<sup>5</sup> Thus, Dr. W. B. Richardson and others believe that Shakespeare studied Helkiah Crookes' book on anatomy, "*Microcosmographia*" (1615),\* "for the closer this book and the book of the plays are read together the more clearly is it detected where and how the dramatist became the student of anatomy."<sup>6</sup> Similarly Dr. Moyes attributes to Shakespeare a knowledge of the book "*Batman upon Bartholome his Booke De proprietatibus rerum*", published in 1582.<sup>7</sup> At least, the view of digestion and nutrition expressed in the famous metaphor in *Coriolanus* seems to be but an amplification of that in

"*Batman upon Bartholome his Booke De proprietatibus rerum*". Shakespeare puts this into the mouth of Menenius:

Note me this, good friend;  
Your most grave belly was deliberate,  
Not rash like his accusers, and thus answered:  
"True is it, my incorporate friends," quoth he,  
"That I receive the general food at first  
Which you do live upon; and fit it is,  
Because I am the store-house and the shop  
Of the whole body. But if you do remember,  
I send it through the rivers of your blood,  
Even to the court, the heart, to the seat o' the brain;  
And through the cranks and offices of man,  
Strongest nerves and small inferior veins  
From me receive that natural competency  
Whereby they live. And through that all at once,  
You, my good friends,"—this says the belly, marke me.

"*Batman upon Bartholome his Booke De proprietatibus rerum*" reads:

The stomach is the purveyor and husband of all the body, and the stomach taketh feeding for all the members and serveth all the members thereof as it needeth, as saith Constantine. (Book V, Chap. 38).

The similarity in idea here is too close to require further comment.

In addition, Shakespeare might have had access to Galen, and perhaps to Hippocrates (at second hand no doubt), or, at least, he was familiar with some of their teachings. "I have read the cause of its effects in Galen", says Shakespeare's Falstaff (*II. Henry IV.*, I, 2, 133); "the most sovereign prescription in Galen be but empiricute . . ." says his Menenius (*Coriolanus*, II, 1, 127).

But it is not necessary to make Shakespeare a reader of medical treatises, nor yet a purposive seeker of medical knowledge in the association with physicians, to account for the abundance of medical material in his plays. As already mentioned, the laity generally knew more of medical matters in Shakespeare's day than they do today. There was no real scientific medicine. Even the medical profession itself had not risen above the pall of the Dark Ages. It was Galen, Aristotle and Hippocrates, and Hippocrates, Aristotle and Galen. These bound medicine with the cords of traditional doctrine; these ruled over science with the tyranny of accepted authority. The healing art was bound up with philosophy, astrology, religion, natural science, magic. Consequently, books of all types, from those on metaphysics to those on cookery, from books of poetry to books of sermons—all abounded in the medical knowledge of the day. Thus, Burton's "*Anatomy of Melancholy*" (1621), Timothy Bright's "*Treatise of Melancholy*" (1586), Thomas Wright's "*Passions of the Minde in Generall*" (1601), Bacon's "*Novum Organum*" (1620), Wilson's "*Arte of Rhetorique*", Fletcher's "*The Purple Island*" (1633), Sir Thomas Elyot's "*Of the Knowledge which Maketh a Wise Man*" (1533) and also his

\* Because this work was published in 1615 Shakespeare could not have seen the printed work. However, since Jaggard published both Crookes' and Shakespeare's works it has been considered by Richardson that he saw it in manuscript form. See B. W. Richardson, Shakespeare and the *pia mater*, *The Lancet*, 1888, 2: 757.

"Castel of Helth", Sir John Davies' "Microcosmos", Huarte's "Examen de Ingenios" (1594), La Primaudaye's "Frecnh Academy" (1594), Charron's "De la Sagesse" (1601), Ludovicus Vives' "Introduction to Wisdom" (1540), and many others—in all these do we find the intellectual arcana of the day. Might not Shakespeare have absorbed these from the very atmosphere about him, and with them the medical materials which he uses in his plays?

Then too, we must not forget that Shakespeare was the friend of university men, companion to Ben Jonson, Heminges, Condell, Marlowe, etc., an acquaintance of Jaggard, possibly Bacon, the Earl of Southampton, and others. Might not he have gleaned from these the intellectual heritage of the day? Surely if Shakespeare himself did not have recourse to the books of the day, then Ben Jonson and the others of the coterie certainly did. In this regard it might be of some significance to note that Thomas Lodge,\* the contemporary of Shakespeare, was a physician, and in 1603 published "A Treatise on the Plague"; also that Thomas Dekker,† another contemporary dramatist, wrote two treatises dealing with the plague. Can it be stretching the limits of possibility too far to suppose that Shakespeare might have shown an interest in such treatises, if not for the subject matter, then for the very fact that contemporaries and perhaps friends of his were their authors?

In addition to all this, there were popular Herbals‡ in Shakespeare's day, such as "The Grete Herball" of Peter Treveris (Southwark, 1516<sup>7</sup>). There were almanacks and versified versions of medical tracts, as well as broadsides and advertising handbills of nostrum mongers.

\* Shakespeare made use of Lodge's "Rosalynd" (1509) in the composing of "As You Like It". He might also have been interested in Lodge's treatise on the plague.

† Following is an extract from "The Wonderful Yeaere 1603, wherein is showed the picture of London Lying sick of the Plague" by Dekker. The treatise gives us a very vivid and graphic account of London during a pestilence. Shakespeare witnessed such pestilences. The particular extract quoted is cited by Creighton in his "History of Epidemics in Great Britain" and illustrates the impotence of the physicians against disease.

"Never let any man ask me what became of our phisitions in this massacre. They hid their synodical heads as well as the proudest, and I cannot blame them, for their phlebotemies, losings and electuaries, with their diacathelicans, diacodiens, amulets and antideres had not so much strength to hold life and soul together as a pot of Pinder's Ale and a nutmeg. Their drugs turned to durt, their simples were simple things. Galen could do no more good than Sir Giles Gooscap, Hippocrate, Avicen, Paracelsans, Ferne-lius, with all their succeeding rabble of doctors and water-casters, were at their wits end, for not one of them durst keep abroad."

‡ John Taylor, the "Water Poet", speaks of

"The paracelsists and Galenists

The philosophical Herbalists"

quoted in Creighton, (*op. cit.* footnote p. 326), p. 515.

"On many a post I see Quacksalver's bills  
Like fencers challenges to show their skill".

writes Taylor, "the Water Poet", about 1603.<sup>8</sup> Dr. John Halle in his "An Historical Expostulation Against the Abuses both of Chirurgery and physyke in Oure Tyme" (1565), cites many examples of such advertising handbills of the day,<sup>9</sup> one of which follows:

If any manne, womanne, or childe bee sicke, or would be let blood, or bee diseased with any maner of inworde or outworde grefes, as al maner of agues, or fevers, plurises, cholyke, . . . goutes . . . bone ache . . . and payne of the joints . . . let them resorte to the sygne of the Sarazen's Hedde, in the easte lane . . . and they shall have remedie,

By me, Thomas Luffkin

Thomas Middleton in his play, *The Widow* (1608), portrays a quack hanging out the following poster at his place of business:

Here within this place is cured  
All the griefs that were ever endured  
Palsy, gout, hydropic humour  
Breath that stinks beyond perfumer,  
Fistula in ano, ulcer, megrim,  
Or what disease soe'er beleaguer 'em,  
Stone, rupture, squinancy, imposthume,  
Yet too dear it shall not cost 'em.  
In brief, you cannot, I assure you,  
Be unsound so fast as I can cure you.

(Act IV, Sec. 2.)

From such sources at least Shakespeare might have acquired the names of diseases.

There were also innumerable quacks and mountebanks putting on spectacular medicine shows. In a London, with a population of only about 150,000, and being himself a frequenter of taverns and of all the other popular haunts of London,\* consorter with all manner and types of people, from groundling to lord, could Shakespeare have helped picking up the general medical knowledge of his day?

But even if we set aside all this as mere conjecture, yet Shakespeare could not have escaped the evidence of his own senses. We must not forget that Shakespeare's England was a plague-ridden England. Disease and death were all about the poet. Houses were quarantined, stamped with the red cross and the words "God have Mercy Upon Us", to warn the passers-by. Abraham Holland, a minor poet of the period in his "Posthuma" (1626), gives us vivid evidence of what Shakespeare undoubtedly witnessed.

\* Shakespeare well knew where the centre of the London drug trade flourished in his day. In the "Merry Wives of Windsor", Falstaff refers to "these lispng hawthorn buds, that come like women in men's apparel, and smell like Bucklersbury in simple time." (III, 3, 76). Bucklersbury actually was the centre of the drug trade in Elizabethan England.

A noon in Fleet Street now can hardly show  
That press which midnight could, not long ago  
Walk through the woeful streets (whoever dare  
Still venture on the sad infected air)  
So many marked houses you shall meet  
As if the city were one Red-Cross Street.<sup>10</sup>

There were bodies in the streets and continual processions of funerals.\* John Taylor, the "Water Poet", takes notice of this

In some whole street, perhaps, a shop or twain  
Stands open for small takings and less gain  
And every closed window, door and stall  
Makes everyday seem a solemn festival.  
All trades are dead, or almost out of breath,  
But such as live by sickness and by death.<sup>11</sup>

Of the sick, Taylor writes,

"Some franticks raving, some with anguish crying"

"Dead corpses carried and recarried still  
Whilst fifty corpses scarce one grave doth fill."

John Davies, of Hereford, in his "The Triumph of Death; or the picture of the plague, according to the Life, as it was in A.D. 1603" adds graphic details to our picture of the plague as Shakespeare probably saw it.

Cast out your dead, the carcass-carrier cries,  
Which he by heaps in groundless graves inters . . .  
The London lanes, themselves thereby to save,  
Did vomit out their undigested dead,  
Who by cart-loads are carried to the grave.

Each village free now stands upon her guard . . .  
The haycocks in the meads were oft oprest  
With plaguey bodies, both alive and dead,  
Which being used confounded man and beast.<sup>12</sup>

During these plagues business was paralyzed, civil courts were closed, and there were exoduses of the rich from London. What was of even more immediate importance to Shakespeare was the closing of the theatres and their removal to the outskirts of the city.†

All these factors must have been forced on his attention. For him to have failed in the acquisition of the general medical knowledge involved in such would have been no compliment certainly to his sense of observation nor to his genius as a moulder of language.

\* See also Pepys' and Evelyn's diaries and also Defoe's "Journal of the Plague Year." Their descriptions of the pestilences are applicable to those Shakespeare witnessed.

† "Plaies are banished for a time out of London" says Harrison in 1572, "lest the resort unto them should ingender a plague, or rather disperse it being already begone"—Extracts from Harrison's M. S. Chronologie, by Furnivall in appendix (p. 268) to "Elizabethan England", Camelot Series 1890.

"Behold the sumptuous theatre-houses, a continual monument of London's prodigal folly! But I understand they are now forbidden because of the plague."—T. W. in a sermon preached at Paul's Cross on Sunday, November 3, 1577.

I am indebted for these quotations to Creighton, (*op. cit.*, footnote p. 326) pp. 494-5.

Further, Shakespeare knew human nature, and he observed it in all its intricate forms. Besides his intuitive insight into the human mind, his opportunities for observation of human action, particularly in the mentally deranged, were indeed numerous. The insane in Shakespeare's day were not confined to asylums. Except in the case of those that became dangerously maniacal the insane were allowed to mix in society. Some however were kept in jail. Since Shakespeare's father was judge, bailiff and jailer of Stratford at one time, it is reasonable to suppose that the youth, William, might have had direct contact with the insane.\* Since, also, it was the custom to board out the more mildly deranged among the householders of a town, this offered further opportunity for direct observation. Thus, Shakespeare must have observed all the degrees of mental derangement, as well as of emotional instability. With the ability of a master he reproduced these for us in his plays. It is true, as the critics hold, that Shakespeare paid special attention to the abnormal states of mind and even of madness. But here again, this is certainly not unique with Shakespeare. We must remember to consider him in the light of his own times. The Shakespearean audience loved to see madness on the stage. Shakespeare's contemporaries often introduced mad scenes into their plays. The wonder of the situation is this: not that Shakespeare depicted madness, but that with the insane all about him being regarded as possessed of the devil or evil spirits, and treated accordingly with the utmost cruelty—chained, flogged, starved, stoned, cast into dungeons, made the butt of amusement of the rabble of the streets as well as of the nobility—but that, with this situation maintaining, he should have regarded the insane as really sick in mind and body, and to have proposed as treatment for them, rest, music, gentle conduct toward them—conceptions several centuries in advance of the majority of physicians of his time.† Shakespeare puts into the mouth of Romeo:

Not mad, bound more than a mad man is;  
Shut up in prison, kept without my food,  
Whipped and tormented and—God-den good fellow.  
(*Romeo and Juliet*, II, 1, 54-59.)

In Middleton's *The Changeling* (1633) is presented a picture of how the insane were treated in Shakespeare's day. Dr. Alibius, in this play, together with his assistant Lollo, trains his

\* I am indebted for this suggestion to C. E. Phelps, His (Shakespeare's) School of Insanity in "Falstaff and Equity", N.Y.: Houghton, Mifflin & Co., 1901, pp. 104-112.

† Dr. Felix Platter (1563-1614) did advocate mild treatment for the insane, but it was not until the 18th century that this was adopted.

"brainsick patients" with the whip, to perform at entertainments, such as weddings, in order

. . . to make a frightful pleasure.  
To finish as it were, and make the fag  
Of all the revels, the third night from the first.  
(III, 2.)

In Thomas Dekker's *The Honest Whore* we have a full scene at Bethlehem Hospital in which madmen are portrayed.

*Sweeper:* Yea, forsooth, I am one of the implements.  
I sweep the madmen's rooms and fetch straw for  
'em, and buy chains to tie 'em and rods to whip  
'em. I was a mad wag myself here once, but Father  
Anselmo, he lashed me into my right mind again.  
(Part I, V, 2.)

But our great poet puts words to the tongue of the physician in *King Lear* which indicate his own ideas in regard to the treatment of the insane. Cordelia asks,

What can man's wisdom  
In the restoring his bereaved sence? (IV, 4, 8.)

The physician answers,

There is means, madam  
Our foster-nurse of nature is repose,  
The which he lacks; that to provoke in him,  
Are many simples operative, whose power  
Will close the eye of anguish. (IV, 4, 11.)

H. Laehr<sup>13</sup> comments on these modern conceptions of Shakespeare. He says that the conception of insanity and its origin in mental and bodily states was given Shakespeare, but that he was a far better observer and knew better how to apply his knowledge of disease than did his literary contemporaries.

But, further, be that as it may, the important reason that Shakespeare was so interested in the abnormal states of mind is not that there was so much madness all about him, nor that it was a custom of the dramatists of the time, but rather because these abnormal states gave him greater play for his abilities in psychological delineations. Would you have the states of mind and the interaction of petty motives of the ordinary humdrum every day life depicted, you will have only gross comedy. Shakespeare was too good a psychologist not to have availed himself of the wide range for psychological delineations present in the abnormal states of mind. But he did not choose actual maniacal madness, for that would have made an end to his purpose. He chose rather to depict the borderline between madness and normality. He took that wavering twilight of the mind between sanity and insanity, to which so many of us, under stress, are so subject, and he painted for us the stirring dramas we have in *Macbeth*, *Othello*, *King Lear* and *Hamlet*. There are very good reasons, then, why Shakespeare should have introduced so much medical material into his works, and made laymen, not physicians, the instruments for the utterances of such medical lore.

What now of the character, the quality, of the medical knowledge in Shakespeare's plays? Is it such that we must attribute to the poet an actual study of the healing art, as so many of the commentators seem to think? And should we credit him with knowledge that even physicians lacked in his day? The truth is that in this, as in everything else, Shakespeare was necessarily limited by the horizon of his century and the limits of his education. The medical knowledge in his plays is of a general character, such as any intelligent observing layman of his day might have acquired in a similar environment. Much has been made of the fact that Shakespeare shows an acquaintanceship with the chief medical theories of the times, especially those of Galen and Paracelsus. But how could he have escaped such knowledge? Aside from the fact that the teachings of Galen, Hippocrates, Aristotle, Paracelsus, Avicenna, Rhazes, and others have crept into the general literature and language of the day, bitter controversies raged regarding those various schools of medicine, particularly one between the Galenists and the Paracelsians. Shakespeare, in fact, refers to this, for he speaks of being "relinquished of the artists . . . both of Galen and Paracelsus" (*All's Well That Ends Well*, II, 3, 10-11). He also flouts the empiricism of the medical practice of the day. He puts into the mouth of Menenius the following:

It gives me an estate of seven years' health in which time I will make a lip at the physician; the most sovereign prescription of Galen is but empiricute, and, to this preservative, of no better report than a horse-drench.  
(*Coriolanus*, II, 1, 124-130.)

Ben Jonson, intimate friend of Shakespeare, also did not fail to notice the two contending schools. In *The Alchemist* he satirizes a type of physician as

A rare physician . . .  
An excellent Paracelsian, and has done  
Strange cures with mineral physic. He deals all  
with spirits, he; he will not hear a word of  
Galen, or his tedious receipes. (II, 1.)

Thomas Middleton in his *A Fair Quarrel*, also shows acquaintance with these matters, for one of his characters is made to say,

"Can all your Paracelsian mixtures cure it?"  
(II, 2.)

Marlowe, too, in his *Doctor Faustus*, says,

"Bid economy farewell, and Galen come."

To challenge the infallibility of Galen in Shakespeare's day, further, "to make a lip" at him, as Shakespeare expresses it, was fraught with serious consequences. Sir Theodore Mayerne, Court physician to James I and also to most of the monarchs of Europe, of whom Shakespeare might have direct knowledge, was forced to flee France in 1607 and to settle in England because he was a follower of Paracelsus. The Royal College of Physicians of

London severely reprimanded any of their members who dared question the teachings of Galen. Thus we read of one Dr. Geynes being suspended from the College in 1559 for such a crime. Only "on his acknowledgment of error and humble recantation, signed with his own hand, was he received into the College."

The London of Shakespeare's day was not too large, nor yet the tongues of gossip-purveyors and scandal-mongers too dulled, for such matters of interest to have escaped the notice of the frequenters of Shakespeare's haunts. We can be sure that, in the course of the conversations, such matters as the medical theories of Galen and Paracelsus would certainly come up. Might not Shakespeare have gained a great deal of his medical knowledge in just such a fashion?

The diseases which Shakespeare mentions most frequently are the plagues and pestilences,\* the "sweating sickness", ague, rheumatism, fevers, measles, leprosy and the "pox". This is just what we would expect. These are the very diseases that prevailed most frequently in Shakespeare's England. His allusions to them, however, merely indicate an observing layman's familiarity with them and not any technical knowledge of their nature, even as understood by the regular physicians of his own day. Indeed, when we go through the plays of Shakespeare the medical expressions found there that can be called technical and unfamiliar to the layman of the day can all be counted on the ten fingers.

The mistake of the 19th century and of most modern commentators on Shakespeare has been this. They have confused a keen sense of observation and a genius for language in Shakespeare with actual medical knowledge. Thus vivid descriptions of the apoplectic stroke, the epileptic fit, the facies of death from strangulation, the general effects of alcohol upon the system, the states of senility, etc.—all these have been cited as proof of Shakespeare's unusual medical knowledge.

We need go no further than the recent book, "William Shakespeare, M.D." by Harry Epstein, M.D., to realize this method of approach so evident in practically all medical critics. Dr. Epstein quotes the famous lines of Jaques, with respect to the seven ages of man (*As You Like It*, II, 7, 140-166); and he adds, "In commenting upon this passage, can one, today, improve upon this excellent description of the sequences taking place in one's lifetime?" Certainly not. Not a physician today, nor one in Shakespeare's day, could do half as well. But does that prove anything about Shakes-

peare's medical knowledge? Does the observation that an infant "mewls and pukes", that a school-boy "whines", and that "second childishness" is, "Sans teeth, sans eyes, sans taste, sans everything", prove anything but that Shakespeare was a good observer and a master of poetic language?

Dr. Epstein quotes from *II Henry IV*:

Have you not a moist eye, a dry hand, a yellow cheek, a white beard, a decreasing leg, an increasing belly? Is not your voice broken, your wind short, your chin double, your wit single, and every part about you blasted with antiquity, and will you yet call yourself young? (I, 2, 200-208.)

and he says, "Could there be a more complete manner of expressing a beginning or an established senility?" Certainly not. But wherein is there any true medical knowledge involved? In like manner, Dr. Epstein quotes a passage from the same play (IV, 3, 103-122), showing Shakespeare's knowledge of "the glowing effects of alcohol" and also another passage showing Shakespeare's knowledge of insomnia (III, 1, 4-31). But one can challenge any member of the Royal College of Physicians and Surgeons, even of today, who could describe "the glowing effects of alcohol" or the tortures of insomnia, who has not himself imbibed of "sherris-sack", or himself have lived through endless nights of insomnia. That Shakespeare described all these sensations so beautifully only proves that perhaps he himself had spent many a hilarious night in convivial drunkenness, and many a tortured night in lonesome sleeplessness, and that he had the power that few physicians have of setting these sensations to language; or, at least, that Shakespeare had the power of imagination to write about these states. Clearly then, such types of evidence to prove Shakespeare's knowledge of medicine (and most medical commentators are guilty of their use) fall far short of fulfilling their aim.

But even the actual passages that deal with authentic medical material in Shakespeare, and that have been used by commentators to prove Shakespeare's medical knowledge, prove nothing of the kind. Thus in the matter of syphilis, Shakespeare has been given much credit for a knowledge of this disease, since he has numerous references to it in his works. Dr. Epstein quotes a passage from *As You Like It* (II, 7, 64-70) to prove this point, and adds,

Shakespeare in these few lines shows an understanding of the way in which syphilis is contracted by sinning, and indicates that promiscuity begets venereal disease . . . Shakespeare clearly describes the sores, and the headed evils accompanying the disease. He refers to the tendency of syphilis to show itself on the forehead, and, when neglected, to cause an increase in the size of the bones of the head, as seen in cranio-tabes and in exostoses found at the temporo-frontal angles.

\* See Dr. J. Moyes, *Medicine and Kindred Arts in Shakespeare*, Glasgow, 1896, pp. 17-20, for quotations referring to these.

All this is merely tribute again to Shakespeare's wide-awake, intelligent observations of the environment in which he lived, for we must not lose sight of the fact, as already pointed out, that in Elizabethan England the average layman knew more of medical matters, saw more of diseases, than the average layman today, and that it was a common thing for all playwrights of the time to refer to medical subjects with much frequency. Syphilis, especially, because of its wide distribution in London in Shakespeare's day, and because of its social nature, was bound to receive particular attention at the hands of everyone. The phrase "a pox on you" was a common oath of the day and entered into ordinary conversations. Shakespeare, as well as his contemporaries, uses it frequently. The fact that he even jests about some of the symptoms of syphilis shows that the disease was well known in all its aspects by his audience. Thus the baldness (alopecia) of syphilis, referred to as the "French Crown" in Shakespeare's day, allows him several opportunities for plays on the word "crown" as a piece of money. In *King Henry V* (IV, 1, 242-246), King Henry is made to say,

Indeed, the French may lay twenty French crowns to one, they will beat us, for they bear them on their shoulders; but it is no English treason to cut French crowns, and to-morrow the king himself may be a clipper.

Similarly, the following occurs in *Measure for Measure*, (I, 2, 36-42).

*Lucio.* Behold, behold where Madame Mitigation comes!  
*First Gent.* I have purchased as many diseases under her roof as come to—  
*Sec. Gent.* To what, I pray?  
*First Gent.* Judge.  
*Sec. Gent.* To three thousand dolours a year  
*First Gent.* Ay, and more  
*Lucio.* A French crown more.

Likewise in *A Midsummer Night's Dream* (I, 2, 95-100):

*Bot.* I will discharge it in either your straw-colour beard, your orange-tawny beard, your purple-in-grain beard, or your French-crown-colour beard, your perfect yellow.  
*Quin.* Some of your French crowns have no hair at all, and then you will play barefac'd.

Thomas Dekker in *The Honest Whore* makes a similar attempt at such humour:

*Castruchio.* . . . pox on't 'tis rough.  
*George.* How? is she rough? but if you bid pox on't, Sir, 'twill take away the roughness presently.  
*Fluello.* Ha, signor; has he fitted your French curse?  
 (Part I, 1, 5.)

Another lesion of syphilis which Shakespeare uses to produce humour is the breakdown of the bridge of the nose, with its concomitant alteration of the voice. The clown in *Othello*, chiding the musicians for their poor music says,

Why, masters, have your instruments been in Naples, that they speak i' the nose thus. (III, 1, 3.)

Thomas Dekker in *The Honest Whore*, refers several times to this lesion of syphilis. In Part I (III, 3) occur the following lines:

How! marry with a punk, . . .  
 I'll be burnt through the nose first.

In Part II (I, 2) one of the characters is made to say, "a pox a' de horse's nose"; and again: (V, 2) "Pox ruin her nose for't."

Philip Massinger in *The Guardian* (IV, 3) also makes reference to this lesion when he puts into the mouth of Calypso the following words:

. . . and I will build  
 An hospital for noseless bawds.

But even on the merits of these passages there is nothing to prove a physician's knowledge of syphilis. Is it so remarkable that Shakespeare recognized "that promiscuity begets venereal disease?" The communicability of syphilis through venereal contact was common knowledge in Shakespeare's day, referred to, all too frequently, in the general literature as the French, Italian, or Spanish Pox, depending, of course, upon the country to which one was antagonistic. Perhaps such communicability was even more apparent to the layman than to the physician. The jolly milkmaids in Jenner's day knew cowpox from smallpox and recognized the immunity produced by the one against the other long before Jenner was born. Would you credit them with extraordinary medical knowledge on that account?

As to the knowledge of the lesions of syphilis described by Shakespeare, no one can deny his observant acquaintance with them. He probably knew more about them than the most educated of laymen today. We may even go farther than this. One can venture to say that Shakespeare knew more of "the headed evils" "as seen in craniotabes and in the exostoses at the temporo-frontal angles" than most physicians of today. What is the answer to this? It is a simple one. The average individual in Shakespeare's environment probably saw more lesions of syphilis, especially of the tertiary types, in one week than the average physician today sees in a life time of practice. And there was probably more craniotabes in London in Shakespeare's day than in the entire United States today. William Clowes, surgeon at St. Bartholomew's Hospital, in his "A Short and Profitable Treatise Touching the Cure of the Disease called Morbus Gallicus by Unctions" (1579) gives the following picture of the gargantuan proportions of the syphilis epidemic in Elizabethan London:

It is wonderful how huge multitude there be of such as be infected with it, and that dayly increase to the great danger of the common-wealth and the stayne of the whole nation . . . In the hospital of Saint Bartholomew in London, there hath been cured of this disease by me, and three (3) others, within this fyve yeares, to the number of one thousand and more, I speake nothing of

Saint Thomas Hospital and other howses about this citye, wherein an infinite multitude are dayly in care . . . among every twentye diseased persons that are taken in fifteen of them have the pocks.\*

The lesions of syphilis were as common and offensive to the eye as the stinks of London were to the nose. For a man of the type of Shakespeare not to have noticed them would seem to us a matter of far greater wonder and amazement than his actual acquaintance with them. And the same holds true for many of the descriptive passages bearing on medical knowledge and offered as evidence of the poet's extraordinary learning in this field. Shakespeare's description of violent death in *Henry VI* is held up as showing his understanding "of the pathological changes that take place in the body." But it shows nothing more than that Shakespeare saw more hangings coldly, observantly, in one month than all the physicians in the United States see in their lifetime, for hangings were frequent and open to the public as holiday spectacles, such spectacles also including the subsequent disemboweling of the victims, at which procedure the hangmen had become quite adept.

Shakespeare's reference to scrofula in *Macbeth* (Act IV), 147-159, Sc., III) is quoted by Dr. Epstein (*loc. cit.*) as showing that "Shakespeare was well aware of the historical fact that the early Saxon kings were believed capable of curing scrofula by the laying on of hands." With the chronicle histories at his disposal, with this very laying on of hands taking place in his own day, he would have had to have been stupid not to have known this. Shakespeare saw more of the "swoln and ulcerous" scrofula in a day than the physician of today sees in many years.

Dr. Epstein quotes passages from *Julius Caesar* to prove that "all this thoroughly demonstrates that Shakespeare understood the nature of epilepsy." If this is the case, then his knowledge was more thorough than that of the greatest neurologists of today, for the true nature of epilepsy is not yet completely known. That Shakespeare knew "epilepsy from the objective standpoint", however, is neither questionable nor yet a matter for wonder. Certainly one cannot call Shakespeare a physician for this knowledge. He witnessed epileptic seizures many times, no doubt, for in a city the size of London there must have been numerous epileptics, who, not being confined in sanatoria, gave many opportunities to the poet. And who,

\* Quoted in C. Creighton, *op. cit.*, p. 424. See also Burnet, "History of His Own Time", I (1823), 395-6, for an account of the prevalence of syphilis among the nobility.

having witnessed an epileptic seizure, can forget the swooning, the foaming at the mouth, the biting of the tongue, etc. And what Shakespeare's eyes saw, his tongue could put to language in unforgettable English.

Dr. Epstein quotes many passages referring to childbirth and intimates that Shakespeare had an unusual knowledge of obstetrics. But he admits that "Shakespeare does not describe the technique of labour and of childbirth, but refers only to anguish associated with it." The truth is, Shakespeare did not know the technique of labour, but with obstetrics in the hands of old wives, with deliveries being carried on in the home, with Shakespeare himself being the father of children, how could he possibly have escaped knowing the anguish of childbirth and referring to it as "a night of groans"? The most ignorant savage cannot escape such knowledge. In a similar manner, there are very few passages in Shakespeare's works, of a medical character, that cannot be explained on the same principles as outlined above.

Once and for all, let us shake ourselves free from the anæsthesia of reason often brought on by fanatic Shakespearean commentators. From a logical standpoint, is it necessary to make Shakespeare a classic scholar, a great lawyer, a great physician? The sane attitude is this: that in the works of the great poet we have a keen brain, an observing mind, a fine memory, a general education, and above all a mighty genius for using language; that out of these attributes, and these alone, he fashioned, unconcernedly, the great works we know by the name of Shakespeare.

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## Association Notes

### The Meeting at Atlantic City

The General Scientific Meetings, which afforded an opportunity to hear many noted speakers from the United States and Canada, were held on Monday and Tuesday, June 10th and 11th, while the officials of the two Associations were dealing with business matters. On the evening of June 11th the opening General Meeting was held, at which an enormous number of medical and lay people were present. Addresses of welcome were given by the Hon. Harry Bacharach, Mayor of Atlantic City, Dr. C. Coulter Charlton, President of the Atlantic County Medical Society, and Dr. Marcus W. Newcomb, President of the Medical Society of New Jersey. An address, appreciative of the work of the medical profession, was delivered by the Hon. Walter Edge, ex-Senator and a former Ambassador of the United States to France. Dr. James S. McLester, of Birmingham, Ala., was then installed as president of the American Medical Association. During the course of this ceremony the retiring president, Dr. Walter L. Bierring, Des Moines, Iowa, made use of the gavel presented to the Americans by the Canadians earlier in the day. The retiring president was presented with a Medal by the Chairman of the Board of Trustees. Dr. J. C. Meakins gave his Presidential Address on "The Breath of Life", and was followed by Dr. McLester, who spoke on "Nutrition and the Future of Man". Both these addresses were followed with close attention. They were published in our July issue. During the evening some delightful music was presented, the singing of the Westminster Chorus, of Princeton, N.J., being specially worthy of note. It is seldom that such a finished production is met with.

The Sectional Meetings began on Wednesday, the 12th, and were continued until Friday, the last day. They were largely concerned with the medical advances of the year. Chief among the many topics discussed were: the new sera for immunization against infantile poliomyelitis; removal of the thyroid gland in angina; collapse of the lung for pneumonia; new uses for artificially induced pyrexia; the effects of various substances on blood vessels, as shown by special microscopes; drug addiction; the isolation of vitamins in pure crystalline form; and the startling results in growth obtained by the administration of extract of the pineal gland in mice. Heart disease, cancer, and tuberculosis, the old "stand-bys", came in for attention. Hormones and the glands of internal secretion also occupied a prominent place on the program. The Section on General and Abdominal

Surgery devoted a large part of its sessions to a consideration of diseases of the blood (something of an innovation!) and also held a symposium on certain diseases that can be treated by removal of the spleen. Two of last year's Nobel Prize winners, Drs. George R. Minot and George H. Whipple were present. Sir Frederick Banting, another Nobel Prize winner, had been expected, but had to be in England at the time of the meeting. Three invited guests from London were present, Mr. Leslie Paton, in the Section on Diseases of the Eye; Mr. Norman Patterson, in the Section on Diseases of the Ear, Nose and Throat, and Sir Francis Shipway, in the Section of Miscellaneous Topics, at its session on Anæsthetics.

It is regrettable that all the papers read at this convention cannot be noticed here, for considerations of space, but those referred to will give a good idea of the scope and quality of the work presented.

### SECTION ON PRACTICE OF MEDICINE

The following papers were read.

The Diagnosis of Hepatic Disorders — DR. DUNCAN GRAHAM, Toronto, Canadian Chairman of the Section, (published in this issue of the *Journal*, page 247.

DR. GEORGE R. MINOT, of Boston, American Chairman of the Section, spoke on Nutritional Deficiencies and the Anæmias. He said in part:

Knowledge of the mild states of nutritional deficiency or instability that lead to development of the anæmias is meagre, and how to obtain such knowledge is a problem of concern to the health of the world.

A good diet throughout life will undoubtedly aid in the prevention of the anæmias caused by lack of certain food elements. It must be recognized that the body should always contain an appropriate reserve supply of nutrient substances for extra demands. A person whose body has had for a long time only just enough of a nutritional factor, such as a vitamin or mineral, to maintain health may be precipitated into the zone of partial deficiency, but if he has an infection he is very likely to develop anæmia, polyneuritis, scurvy, or some other disease, according to the substance that is missing from his system. At present this borderline state is difficult to prove, though it can be suspected after careful study of the person's dietary history.

Dr. Minot discussed the causes, diagnosis and treatment of the various kinds of anæmia caused by nutritional deficiency. These may arise from a lack of iron, vitamin C, or the mysterious substance in the liver that has reclaimed pernicious anæmia from the class of hopeless diseases. Dietary deficiency is seldom confined to one factor; it is not rare to find combined deficiency in iron and the liver factor in one person.

Deficiencies in the liver substance may be brought about in various ways, among them lack of digestive power, removal of the stomach, or its destruction by cancer, a diet containing too little of the foods that form the proper material, and faulty absorption after the material is formed. It is important to remember, too, that such factors as infection, serious damage to

vital organs, and hardening of the arteries may inhibit nutrition and intensify the deficient state.

Pernicious anæmia should be diagnosed earlier than it is; often it is not recognized until the person had been sick a year. Other diseases frequently complicate the picture; for instance, chronic arthritis, gall-bladder disease and diabetes are often found with pernicious anæmia.

Dr. Minot cautioned physicians to realize in prescribing for anæmias that they are treating persons with a generally deficient nutritional state, of which anæmia may be but one symptom. The object of treatment is not only to control symptoms but to restore reserve supplies and the nutritional state to normal for the rest of their life. Satisfaction with great improvement is not enough; the sick person must be made as well as possible. All aspects of the case must be attended to, including the patient's manifold problems of thought and action.

**Further Data on Artificial Pneumothorax in Experimental Lobar Pneumonia—S. S. LEOPOLD and L. M. LIEBERMAN.** A report of progress.

**Artificial Pneumothorax in the Treatment of Lobar Pneumonia—F. G. BLAKE, M. E. HOWARD and W. S. HULL.**

This study of the effect of artificial pneumothorax in 40 cases of lobar pneumonia indicates that it is of therapeutic value only when instituted within forty hours after onset of the disease and only when practically complete collapse and immobilization of the involved lobe is attained. To accomplish this it is necessary to introduce sufficient air to raise the mean intrapleural pressure to atmospheric pressure with the patient lying on the uninvolved side. Pre-existing fibrous pleural adhesions may prevent adequate collapse. Some cases of forty to sixty hours' duration seem to be benefited. Later than this the method does not appear to be useful. The beneficial effects in early cases would appear to be due to immobilization of the acutely inflamed lung and not to the earlier appearance of humoral antibodies. Successful application of artificial pneumothorax requires that lobar pneumonia be regarded as an acute emergency demanding immediate action.

**Factors Causing Bronchiectasis; Their Clinical Application, Diagnosis and Treatment—W. P. WARNER, Toronto.**

Dr. Warner reported on a study of 110 cases of bronchiectasis, which disease has been much better understood since a way was found in 1922 to make the bronchial tubes visible on x-ray films.

Of the 110 cases, 59 per cent were definitely traced to known illnesses. Half of these followed influenza; another 30 per cent, pneumonia; and the remainder, whooping-cough, acute bronchitis, measles, cancer, and a foreign object lodged in a tube.

In Dr. Warner's opinion, infection damages and weakens the walls of the bronchial tubes and they become stretched during normal breathing because they have lost their elasticity. If in addition the lungs are diseased the forces exerted on the bronchial tubes may be even greater.

There are cases of bronchiectasis reported as existing at birth, but Dr. Warner was skeptical about them. He believes practically all cases can be adequately explained as acquired.

The most common symptoms of bronchiectasis are chronic cough, with considerable secretion, sometimes with so evil an odour that the person is a social outcast. There may also be slight or profuse hæmorrhages. The typical patient with the disease is not bothered by anything except his cough; some cases may be so severe that the person is chronically in ill health. Plain x-ray examination of the chest has no value in detecting

bronchiectasis, except to show whether tuberculosis is causing the symptoms. Films made after the injection of iodized oil are the one important means of diagnosing the disease. The outlook for those affected varies tremendously with the individual case. Bronchiectasis may be rapidly fatal, or a person may have it all his life and die of some other disease. Surgery is the only method of cure, as the tubes never return to their normal size, but the procedure is so dangerous that it should not be advised unless the patient is seriously disabled.

**The Antihormone Theory in Relation to Anterior Pituitary Physiology—JAMES B. COLLIP, Montreal.**

Dr. Collip, who first announced the theory of the existence of antihormones about two years ago, stated that substances antagonistic to several hormones of the pituitary gland have been identified in the blood of a few human beings, but the results are as yet too fragmentary to allow any conclusions to be drawn as to the significance of this discovery. The newest among the antagonistic principles found in his laboratory is one that inhibits the production of the hormone concerned with the assimilation of fatty acids and certain other common food factors. Further study on this "antagonist" will almost surely throw some light on diabetes and other diseases in which the mechanism of assimilation of fats is disturbed.

Antihormones have previously been identified for the hormone of the pituitary that stimulates the thyroid gland and one of those that apparently control the sex glands. There is, in addition, some evidence that an antihormone has been found for the growth hormone.

It remains for further work to show the way in which antagonistic principles are produced and to determine the significance of abnormal amounts of them in the blood.

**Recent Advances in Knowledge of the Relationship of the Pituitary to Ovarian Hormones—DAVID P. BARR, St. Louis.** A useful review of the subject.

**Leukæmia—J. FURTH, H. W. FERRIS AND P. REZNIKOFF, New York.**

Leukæmia, a fatal disease characterized by an excessive number of immature white cells in the blood, resembles cancer in a number of ways. In the first place, it is, like cancer, a neoplastic disease; that is, the cells that multiply with such disastrous effect are malignant cells with characteristics of their own, competent to form a new and abnormal growth. In studying leukæmia in mice Dr. Furth and his associates found that the disease apparently can arise from a variety of causes and the form it takes depends on various factors. In these respects it also resembles cancer.

The recent studies, made in the departments of pathology and medicine at Cornell University Medical College, entailed a comparison of the manifestations of the disease in mice and men. Detailed study of the organs affected revealed that when photographs were made of the microscopic changes in the tissues it was often difficult, if not impossible, to tell from which species the pictures were made.

Heretofore it has been thought that acute leukæmia is in some way brought on by attacks of infection. But Dr. Furth and his co-workers believe they have evidence that the reverse process is what really happens—the derangement of normal cell formation helps to break down resistance to infection.

In mice they found that experimental leukæmia goes through a latent period, then suddenly ends in an acute illness. They believe that during this latent period the

normal blood-forming tissues are replaced by the malignant blood cells.

Close questioning of their human patients revealed that the disease had probably been in progress long before the onset of the infection that led to the diagnosis. Slight symptoms, such as pallor, fatigue, loss of appetite, and poor digestion had been given little attention.

Renal Amyloidosis—W. R. KENNEDY, Montreal.

Dietary Factors in Health and Disease—W. R. CAMPBELL, Toronto.

Pleural Shock—W. F. HAMILTON, Montreal.

These papers will appear in full in the October *Journal*.

## Hospital Service Department Notes

### The Ontario Society of Radiological Technicians

Under the sponsorship of the Ontario Medical Association an Ontario Society of Radiological Technicians has just been formed. It has been felt for some time that some such organization was needed to help create a desirable standard of qualification for technicians in this field and to provide some guidance to hospitals in selecting technical assistants. Serious difficulties, particularly in smaller institutions, have been that the technician frequently has had a very mediocre training, disputes often arise concerning the privileges and responsibilities of the technician, opportunities for further study are limited, and vacancies are often filled from the viewpoint of salary requirements rather than of technical credentials.

The new organization has a very fine constitution. Those technicians who are now engaged in radiological work, and are working in an ethical manner under the supervision of a qualified medical practitioner, and who have had three years of training, may become members of the register by December 31, 1937. Technicians who have not completed their three years of training may register as "students" and be registered as members without examination at the completion of the training period. Future candidates must have junior matriculation, including physics and chemistry, or, if a graduate of a commercial course or a registered nurse, must pass an equivalent examination in physics and chemistry. They must have passed examinations in anatomy and physiology and have obtained a first-aid certificate. Examinations

All communications intended for the Department of Hospital Service of the Canadian Medical Association should be addressed to Dr. Harvey Agnew, 184 College Street, Toronto.

tions shall be held semi-annually and shall be both written and oral in theory and technique, as elaborated in the Constitution. Medical radiologists may become active members on recommendation of the executive committee.

Each active member may use the title, Registered Radiological Technician. The initials are qualified R.R.T.(G.), (T.), or (G.T.), depending upon whether the qualification is in Radiography, in Radiotherapy, or in both. Those who have displayed particular ability and have had at least five years of experience may obtain the diploma of "Master Radiological Technician" (M.R.T.). After December 31, 1936, this diploma will be given only after a special examination.

The ethical standards of the new organization are quite high. No non-medical member shall accept patients for radiological therapeutic work except under the direction and supervision of a qualified medical practitioner, nor shall any such member make any report or diagnosis on any radiographic or fluoroscopic examination. Any such action shall be considered as sufficient to disqualify a member. However, there is a provision that it shall not be considered as contrary to the spirit of this regulation for a member "under special circumstances at the request of the medical practitioner in charge of the case and in the absence of his 'chief' to describe to such medical practitioner the appearance seen in an examination to such extent as may be necessary to assist him in making the diagnosis". Moreover, no non-medical member shall operate an independent laboratory under cover of the name of a qualified medical practitioner.

This new organization has already received wide endorsement. Much credit is due to the Organization Committee and particularly to its Chairman, Dr. W. A. Jones, of Kingston. This Society will be closely linked with the Ontario Medical Association, which latter body will appoint one of the members of the Executive Committee of the Society. The Constitution provides also for a possible amalgamation or merger of this body with a national or federal society of radiological technicians, should such be formed, a suggestion that has been under advisement for several years. The President of the Society is Mr. J. H. Coones, of the Standard Clinic, Peterborough, and the Secretary is Mr. R. H. Bradley, of 44 Victoria Street, Toronto.

### Meeting of the Canadian Hospital Council in October

Arrangements have been made for the biennial meeting of the Canadian Hospital Council, which is scheduled for this year to be held in Ottawa on Tuesday, Wednesday and Thursday, October 8th to 10th. The sessions will be held at the Chateau Laurier, where ample accom-

modation has been reserved. Official delegates are expected from the twelve hospital associations in Canada and nearly all of the provincial governments; already the federal government and quite a number of the provinces have named their representatives.

As at the Winnipeg meeting in 1933, it is anticipated that the sessions will be entirely informal. An agenda of subjects and topics of particular interest to the hospital field is being arranged, and these will be discussed in turn. These debates will prove most interesting, as the representatives participating will all be either outstanding hospital leaders in their own provinces or governmental officials closely in touch with hospital problems. Moreover, the practices and experiences of every province in Canada can be drawn upon for these discussions, which will be presided over by the President, Dr. Fred. W. Routley, or the First Vice-president, Mr. W. R. Chenoweth.

The reports of the various study committees will form the basis for much of the discussion. For the past two years some eleven committees have been actively studying various hospital problems and some excellent reports are anticipated. The Secretary, Dr. Harvey Agnew, reports that already several very valuable studies and reviews have been completed, and the remainder are expected within the next few weeks. Following the meeting, these will be amplified and made available for distribution.

While the first two days of the sessions will be devoted to general subjects and will constitute the sessions proper, the third day will take the form of a special meeting to consider the details of effecting a common basis for all of the provinces of statistical returns of hospital data. Much has already been accomplished in bringing about this co-ordination, and this meeting of provincial representatives and the Committees on Accounting and on Administration and Statistics should complete much of the task. This session is being sponsored by the Dominion Bureau of Statistics, and will be presided over by its Director, Mr. R. H. Coats.

While the sessions constitute primarily the deliberations of the official representatives or their alternates, all hospital workers are most cordially invited to be present. The accommodation provided will be adequate for many visitors. While the privilege of the ballot on recommendations and policies must, of necessity, be confined to accredited delegates, interested hospital workers may, at the discretion of the Chair, participate in the discussions.

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Contemn riches and thou shalt be rich; contemn glory and thou shalt be glorious; contemn injuries and thou shalt be a conqueror; contemn rest and thou shalt find rest; contemn earth and thou shalt find heaven—St. John Chrysostom.

## Provincial Association Notes

### The New Brunswick Medical Society

The fifty-fifth annual meeting of the New Brunswick Medical Society was held this year in Fredericton on July 9th and 10th. The attendance was larger than average, and the greater number of those attending registered early on the first day. Mayor W. G. Clark, of Fredericton, extended a most cordial welcome to the Society.

Among the reports submitted to the meeting, that of the Registrar of Council, Dr. S. H. McDonald, was this year most interesting, for, as an innovation, it recorded much more of the work done by the Council and gave details of this body's work, which was much appreciated by the membership at large.

The Workmen's Compensation Board Buffer Committee reported a rather successful year's relations with the Workmen's Compensation Board. This committee, composed of Drs. R. A. Hughes, Jos. Tanzman and O. B. Evans, were re-appointed for the year 1935-36.

Dr. R. M. Pendrigh presented the treasurer's report which showed the finances of the Society to be in good condition. The report of the Executive Committee and Secretary, combined, was read by Dr. A. S. Kirkland. This report recorded a fresh effort to provide exchange lectureships within the Province, in an effort to keep alive the spirit of the extra-mural lectures previously provided through the generosity of the Sun Life Assurance Co.

Dr. C. J. Veniot reported to the Society the activities of the Canadian Medical Association Executive Committee of which he had been a member during the past year. At this point, Dr. T. C. Routley was invited to elaborate some of this report particularly in relation to the proposed revision of the by-laws of the Canadian Medical Association. Dr. Routley's talk was listened to with interest, and it was suggested that as the by-laws of the New Brunswick Medical Society were in process of revision, care should be taken to parallel as much as possible the Canadian Medical Association structure.

On the afternoon of Tuesday and the morning of Wednesday, six scientific papers were presented and in each case opportunity was given for discussion. The program follows.

Dr. R. E. Powell, Montreal—"The present status of obstructions of the bladder".

Dr. Cecil E. Kinley, Halifax, N.S.—"Some observations on oral cancer".

Dr. E. K. McLellan, Halifax, N.S.—"The proper place of forceps in obstetrical practices".

Dr. A. T. Bazin, Montreal—"Acute infective osteomyelitis and its sequelæ". (Lantern slides).

Dr. E. C. Menzies, Fairville, N.B.—"Modern treatment of cerebro syphilis".

Dr. J. C. Meakins, Montreal—"Arteriolar infarction with particular reference to cerebral hæmorrhage and coronary lesions".

On the evening of Tuesday, the annual dance and bridge was held at the Fredericton Golf Club. The following afternoon the golf competition for the Van Wart Trophy was played at the same club. The winner of the trophy this year was Dr. E. C. Menzies, Superintendent of the Provincial Hospital.

At the final business session the following resolutions were passed:

1. That a committee be appointed to revise the by-laws of the Society.
2. That a committee be appointed to meet any royal commission that may be appointed to investigate national health problems in this Province or in the Dominion as a whole.
3. That in the opinion of this Society the intention and purpose of the Coroners' Act would be best fulfilled if all coroners were members of the medical profession.

The question of the registration of specialists was introduced by correspondence from the Secretary of the Canadian Medical Association and this matter was referred to the incoming executive.

The election of officers resulted as follows: *President*, Dr. J. M. Barry, Saint John; *First Vice-president*, Dr. A. L. Gerow, Fredericton; *Second Vice-president*, Dr. J. R. Nugent, Saint John; *Treasurer*, Dr. R. M. Pendrigh, Saint John; *Secretary*, Dr. A. S. Kirkland, Saint John.

*Additional Members of the Executive*: Drs. A. F. VanWart, Fredericton; C. J. Veniot, Bathurst; J. F. L. Brown, Woodstock; A. M. Sormany, Edmundston; W. E. Gray, Milltown; A. E. Macaulay, Saint John.

An invitation was received from Dr. R. G. Duncan, as Mayor of Bathurst, inviting the New Brunswick Medical Society to meet in Bathurst in 1936. This invitation was unanimously accepted. At the suggestion of Dr. Routley, it was arranged that the annual meeting in 1936 would be on a date approximating that of the Nova Scotia Society. The reason for this change was that the incoming President of the Canadian Medical Association was desirous of visiting all parts of the country during his term of office, and it might be possible for him to attend these meetings in the far east providing they were held on dates close together.

The afternoon business session was then adjourned until the completion of the annual dinner the same evening. At this dinner, Dr. J. C. Meakins, President of the Canadian Medical Association, and Dr. T. C. Routley, General Secretary of the Canadian Medical Association, were heard in interesting addresses relative chiefly to activities of the Canadian Medical Association. There was a free discussion following both addresses and the motion was put and unanimously carried "that the meeting of the

New Brunswick Medical Society approves in principle the proposed measure of closer union between the provincial and national medical societies, and that the executive be instructed to examine the whole question very carefully and bring in a report at the next annual meeting."

A. STANLEY KIRKLAND

## Special Correspondence

### The Edinburgh Letter

(From our own correspondent)

The subject of maternal mortality in Scotland is dealt with in an important Report which has just been issued by the Department of Health. It is officially described as "a challenging contribution to the study of one of the most urgent public health problems of the day". The inquiry on which the Report is based was instituted by the Department of Health in 1929, and was carried on for more than three years. Full reports were received with regard to every death that occurred during pregnancy, parturition, and the first four weeks of the puerperium. The total number of deaths of women in child-birth investigated was 2,465. To enable the Medical Officers of the Department to have knowledge of the incidence of maternal morbidity an additional investigation into the circumstances attending all births in Scotland was carried out for a period of six months. This part of the inquiry has been of value in furnishing information regarding the causes of morbidity and in elucidating various matters of sociological importance.

The Report states that the average number of maternal deaths is about 650 to 700 a year, giving a rate of 6 per 1,000 live births. The completed schedules show that of the 2,465 maternal deaths 1,739 (70.5 per cent) were due to diseases aggravated by child-bearing.

In classifying deaths under the headings of "avoidable" and "unavoidable" every report was very carefully considered before the final decision was made. No death was classified as avoidable if there was reasonable room for doubt. In this connection the authors of the Report place on record their appreciation of the invaluable assistance afforded by the late Dr. Haig Ferguson, of Edinburgh, who personally studied every completed maternal death report received. The grouping arrived at on these lines shows that of the total numbers of deaths 58.7 per cent were avoidable; 21.61 per cent being attributed to negligence of the patient and 37.09 per cent to some faulty technique of the attendant, including doctor, midwife and institution. The conclusions of the Report in relation to this aspect of the subject will doubtless meet with considerable criticism

on the part of many members of the medical profession.

It is stated that in the main groups of sepsis, failed forceps, shock and post-partum hæmorrhage, there is little doubt that in the majority an undue desire to "hurry" the confinement was at the root of most of the troubles. It is stated that the evidence shows that the resort to artificial interference with the normal process of delivery is excessive, and it is recommended that "before anything more than minor instrumental or manipulative interference is attempted at any stage in labour the advice of a recognized obstetrician should be obtained."

The information furnished suggests that maternal mortality is less dependent on environmental conditions than is generally thought. It also shows that, in general, the risk of child-bearing increases with the age of the mother, except that those under twenty years of age have a slightly greater risk than those of the age group 20 to 25.

The question of how far ante-natal care diminishes the risk to the mother is explored. Of the 2,465 deaths 694, or 28.17 per cent, were classified as being due to lack of adequate ante-natal care. It is stated that the general level of ante-natal care is unsatisfactory and that the number of ante-natal beds in the country is inadequate.

Emphasis is placed on the need for child-bearing being regarded as a single physiological process, to be supervised as a unity, and for medical supervision commencing as early in pregnancy as possible and continuing throughout. It is also stated that in some cases the condition of the women at the beginning of pregnancy was such that an unfavourable outcome was almost certain, and in many of these the women had been warned at the immediately preceding confinement of the danger incurred. The report states that where women in such conditions desire practical instruction in contraceptive methods they should have access to expert instruction. It deprecates the undue publicity which is given to the dangers of child-bearing, and indicates that many of the recommendations imply the organization of a comprehensive service designed to cover adequately the whole field of maternity provision in Scotland.

7 Drumsheugh Gardens,  
Edinburgh.

R. W. CRAIG.

### The London Letter

(From our own correspondent)

The annual representative meeting of the British Medical Association has just been concluded in London on the eve of the departure of the officials and members who are making the trip to Australia. By the time these lines appear in print many of the travellers will have visited Canada, and their word-of-mouth report

of the Association's affairs will be of more value than this brief summary. To the outsider the proceedings at this medical forum seem to have been of great importance. A discussion, for example, on the now ever-expanding form of contract practice under the title of public medical services revealed that there are many members of the profession who are not only in favour of some wide expansion of the present field covered by the State but eager that the profession shall be in a position to put things right before the Government takes over the existing service and not afterwards. A motion was carried asking for a higher income limit for those patients who wish to secure their medical aid through some service, and while this step was regarded by some as the beginning of the end there were others who publically expressed their absence of regret that the present methods of providing medical aid were likely to be considerably modified in the future.

The future of midwifery in general practice also formed the subject of a good discussion, and it was agreed that the Council should investigate the diminution of opportunities for this branch of medicine for those in general practice. (In this connection it may be noted that the London County Council has decided to create a whole-time midwifery service along the lines recommended by the Joint Midwifery Council). In the course of the debate it was agreed with acclamation that the great publicity which the subject of maternal mortality received in the lay press was to be deprecated, as possibly accounting for the increased incidence of obstetric shock.

A demand for a re-publication of the celebrated book "Secret Remedies" was rejected by a small majority. In this connection it is interesting to note that recently the Minister of Health gave a sympathetic answer to a request for legislation to control the advertisement of medicines and appliances. It is now over twenty years since a Select Committee of the House of Commons reported on the whole question of the sale of proprietary medicines in such a damning way that it was confidently expected that action would be taken to end this public scandal. The deputation which waited upon the Minister recently was widely representative of the conflicting interests, and it was able to announce that the draft Bill represented a measure of agreement never before reached. While more spectacular matters may attract the attention of our lawgivers in the matter of health there are many who believe that the patent medicine ramp does mean a serious menace to the real health of the nation.

While the prospects of dealing with patent medicines seem none too rosy the results of the recent demands of the osteopaths for registration have been thoroughly satisfactory. The

Select Committee of the House of Lords appointed after the Osteopaths Bill had passed a second reading has now reported that the Bill be not proceeded with. It will be recalled that in the course of the proceedings of the committee the supporters of the Bill withdrew their claims, but the committee has considered it wise to give a full report which is surprisingly unanimous and without any reservations—even although the committee contained members of widely differing views. It seems clear that the claim of the osteopaths to treat all diseases and the absence of a satisfactory teaching centre were the points upon which their demands were defeated. The terms of the report leave no doubt that the matter is now disposed of for many years to come.

The first refresher course of the British Post-graduate Medical School has been completed and the second is in progress as these notes are being prepared. The first venture of the new school has been generally pronounced as a great success. The staff at the school undertook the main bulk of the instruction but, as has been announced as a policy, certain outside specialists took part in special series of demonstrations and for two days there were visits to outside institutions. It is clear that what the practitioners appreciated most were short clinical instructions, especially where these were supplemented by pathological demonstrations and x-ray exhibits of the diseases discussed. The general arrangements of the demonstration theatre were considered excellent, and since the members of the course were asked to and did express their views on the whole fortnight there is no doubt that subsequent arrangements will be even better than the first.

The latest contribution to the subject of road accidents is a report by a committee of the British Medical Association on the relation of alcohol to motor car disasters. The subject is a complex one as the committee admit. Asked by the Minister of Transport to make observations on the subject the committee set up has accepted the well-recognized fact of the dangers of large amounts of alcohol, and concentrated upon what happens with small doses. Pointing out the evidence which points to muscular inco-ordination even with "small drinks" the committee reaches the inevitable conclusion that almost any alcohol will impair the ability of the motor driver. The motoring associations rather resent this, and it is certainly not very clear whether the Minister of Transport has got the answer he requires. The question of what is termed "proper control" of a vehicle is the essential part of the present problem. It seems that the evidence upon this vital aspect is still missing.

ALAN MONCRIEFF.

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## Medico-Legal

### XI.

#### Dame Ducharme v. Hôpital Notre-Dame\*

Quebec—Autopsy without consent of the wife and family of the deceased—Responsibility of hospital—61 Vict. Chap. 82, Sect. 20, and 14 Geo. V, Chap. 117, Sect. 20—Definition of "medicines" or in French "remèdes".

The husband of the plaintiff was taken to the Notre-Dame Hospital in Montreal on March 31, 1930, suffering from diabetic gangrene, and there he died on April 4, 1930, following an operation. An autopsy was subsequently performed on his body without the consent of his wife, the plaintiff, or his family. The wife thereupon took the present action for damages.

The court laid down as a principle of law that the corpse of a deceased person remains the property of his surviving consort and of his family. In principle then the surviving consort and the family of the deceased have a right of action in damages against those who, without their consent, perform an autopsy upon his corpse. Exceptionally, however, the Quebec Legislature has in the case of the Notre-Dame Hospital provided:†

In the case of non-paying patients who die in the hospital, the attending physician or chief house physician may hold or cause to be held a *post-mortem* examination of the body, if he consider that such *post-mortem* examination is desirable from a scientific point of view and to establish the true cause of death; and the medical board may make the regulations which it deems necessary for that purpose, provided that nothing in this section shall be interpreted contrary to the provisions of the law respecting anatomy.

Every patient shall be considered a non-paying patient within the meaning of this section who does not pay for the medical care and the medicines, even if he pays for his maintenance in the hospital, as also every patient whose hospital treatment is paid for, on account of his poverty, by a municipal corporation.

Since it had been proved that no consent was ever given, the defendant hospital, to escape responsibility, must prove (a) that the autopsy was ordered by the attending physician or the chief house physician after he had assured himself that it was desirable from a scientific point of view and to establish the true cause of death, and (b) that the husband of the plaintiff was a non-paying patient in the meaning of the statute.

On the first point there was no doubt. The autopsy had been ordered by the chief house physician in the interests of science and to discover the true cause of death. The second point was not so certain. The deceased was cared for

\* Superior Court, Mr. Justice Archambault. Reported in (1933) 71 S.C. 377.

† "An Act to consolidate the charter of the Notre-Dame Hospital, Montreal, and its amendments", 61 Vict., Chapter 82, Sect. 20 replaced by 14 Geo. V, Chapter 117, Sect. 20.

in a public ward, and for his maintenance there he paid two dollars a day. He had not, however, paid for medical care and he had not paid for all the medicines he had received. The defendant argued that he had paid for no medicines, and that the only sums paid in addition to maintenance, namely, ten dollars for the operating room and five dollars for an anæsthetic, could not properly be considered for "medicines". It argued, in effect, that "medicines" mean only those substances absorbed by the patient or applied to him for the purposes of cure.

The court refused to interpret the word "medicines" in the restrictive sense suggested by the defendant. To have done so would have meant that patients who had paid for x-rays or for other procedures designed for diagnosis rather than cure, or for drugs to relieve pain, would fall within the exceptional provision of the statute. This, said the court, was not the intention of the legislature. It was therefore held that the defendant, having been paid for the use of the operating room and for an anæsthetic, and therefore for "medicines" as the term is used in the statute, had lost the benefit of the exception created in its favour and was liable to damages. However, it was held, in addition, that the plaintiff has failed to prove that she had suffered any specific damages. She had alleged that the autopsy had seriously affected her health, but the court felt that this had been affected by the death rather than by the autopsy. Fifty dollars, by way of exemplary damages only, were awarded her.

(G.V.V.N.)

## XII.

### Dame Phillips v. The Montreal General Hospital\*

Quebec—Responsibility of hospital for unauthorized autopsy—Right of widow to recover damages—*Dommage morale*.

This judgment was referred to as authority by Mr. Justice Archambault in the decision rendered by him in *Dame Ducharme v. Hôpital Notre-Dame* reported above. The case is an old one, but the principles involved are so interesting and were discussed so fully by the late Mr. Justice Davidson that reference to it should be made here.

The plaintiff's husband had entered the Montreal General Hospital as a semi-private patient on April 15, 1907. There he died of cancer on the following 17th of June. The plaintiff alleged that the Hospital had, in spite of her instructions to the contrary, allowed an autopsy to be performed, and that this had injured her health and her feelings, had caused

insomnia and had brought about "*une dépression morale qui empoisonne son existence*." The defendant inscribed in law against the plaintiff's declaration, on the ground that it had not been alleged in what manner, if at all, she had inherited any right from her husband with respect to his body after his death.

It has often been asserted as a principle of the English common law that there can be no property in a dead body. This explains the statement that the dead body of a human being cannot be stolen. The defense argued that the law protects only the person, the reputation and the purse, and that the present claim did not involve injury either to the person, or the reputation of the plaintiff, nor, since there can be no property in a dead body, to her purse.

Mr. Justice Davidson doubted whether these were accurate statements of the common law, and pointed out that in the United States at any rate it was recognized that an unauthorized autopsy constitutes an unlawful trespass on personal rights, and is possible of arousing such a sense of outrage and of mental suffering as to constitute proper elements of compensatory damages. Whatever the common law, however, under the French civil law a person may during his lifetime dispose of his remains in whole or in part, so long as the disposition does not offend against public order or police regulations. He might will his body to a school of anatomy. In the absence of a testamentary disposition the remains are, in a limited sense, the property of the deceased's family. Members of the deceased's family have therefore at least a *prima facie* right to recover damages for an unauthorized autopsy on the body of the deceased.

On the question of damages the court held that there was a right of action to recover for moral as well as material damage. Thus, damages have been awarded a parent for the mental suffering caused by an attack upon the character of his minor daughter. The mental suffering caused by the breach of a promise of marriage has also been admitted as an element of compensatory damages. The court continued "In as high a class, at the least, are the almost reverential feelings with which a family safeguards the body of its dead. Immunity as regards them all is itself a property. The control of a husband or wife over the remains of the other and their burial is paramount, provided normal relations of marriage existed at the time of death. Relatives come next in order of kinship. What results, specific dispositions in a will might produce do not need decision. Hence, if a right of action exists the plaintiff has it." The inscription in law therefore was dismissed, the circumstances of the act complained of by the plaintiff being left for proof at the trial. (G.V.V.N.)

\* (1908) 33 Que. S.C. 483 and (1908) 14 R.L. n.s. 159, Superior Court, Davidson, J.

## Abstracts from Current Literature

### Medicine

**The Thymus Superstition.** Hudson, H. W., *New Eng. J. Med.*, 1935, 212: 910.

We are in a somewhat chaotic condition because of the insistence of some hospitals that x-ray examination of the thymus be made before an operation of election, while other equally prominent institutions have no such requirement. In 1926 the Medical Research Council and Pathological Society of Great Britain formed a committee to collect information on a large scale, for the purpose of establishing standards and investigating closely the precise cause of death in persons dying suddenly from unexplained or trivial causes when the only apparent abnormality was the presence of a large thymus. Their conclusions were, "An abnormally large thymus in itself cannot be considered to be the indication of status thymic-lymphaticus when no obvious cause of death is found *post mortem*. In the opinion of the Committee the facts elicited in the present inquiry are in harmony with those of Hammar and Greenwood and Woods in affording no evidence that so-called status thymico-lymphaticus has any existence as a pathological entity."

In a study made by Boyd she states, "These roentgen findings agree with the anatomical ones, that the largest thymuses occur in healthy children killed suddenly by accidents and that the thymus weight, body weight, ratio decreases with age. At all ages the variability of the weight of the thymus is high." "When illness has lasted longer than twenty-four hours, the weight of the thymus is reduced regardless of the cause of death, with the exception of tumours of the thymus, leukæmia, and exophthalmic goitre."

Garland examined the records of 1,564 autopsies performed at the Massachusetts General Hospital. He concludes, "The present vogue x-raying for thymus and radiating all cases in which a shadow appears would seem to be unjustified."

Dr. J. L. Morse says, "There is much doubt whether the deaths that are attributed to status lymphaticus during anæsthetization and operation are really due to it. There is no proof that enlargement of the thymus is a primary or causative factor in the complex described as status lymphaticus. There is no justification, therefore, for the assumption that shrinkage of the thymus with the roentgen ray will have any effect on status lymphaticus. There is much reason to believe that many of the roentgenograms taken do not show the real size of the thymus, and much evidence to show that it is very difficult to decide from a roentgenogram whether the thymus is larger than it ought to be in the given child in the given time. It does

not seem reasonable or justifiable to say that a roentgenogram should be taken of every child before anæsthetization or operation; that treatment should be given in every case before anæsthetization and operation, if the roentgenologist thinks that the shadow is enlarged; and that the physician or surgeon who does not follow this course of procedure is negligent." The evidence does not support the contention that the thymus may be a cause of sudden deaths in infants and children. Unnecessary parental anxiety, unnecessary expense, and unfortunate legal complications can be avoided. The continuation of an unwarranted fear by physicians and hospitals is undesirable.

LILLIAN A. CHASE

**Initial Attacks of Rheumatic Fever in Patients over Sixty Years of Age.** Ferris, E. B. and Myers, W. K., *Arch. Int. Med.*, 1935, 55: 809.

The authors report 6 cases of patients over sixty years of age with first attacks of rheumatic fever. Rigid criteria for diagnosis included polyarthritis, together with active cardiac involvement, with electrocardiographic changes, and a clinical course consistent with the disease. Three of the patients died, and the diagnosis of rheumatic fever was confirmed at autopsy. The patients who recovered gave no history of previous rheumatic infection, nor was there any evidence of valvular disease of cardiac hypertrophy at the time of onset. The signs and symptoms of rheumatic fever in these patients were essentially the same as those encountered in younger individuals, except that the manifestations in the joints were less intense and more persistent. In view of their experience the authors emphasize that in older patients with polyarthritis rheumatic fever should be considered as a possibility.

LEYLAND J. ADAMS

**A Study of the Diagnostic Value of Sternal Puncture in Clinical Hematology.** Reich, C., *Am. J. M. Sc.*, 1935, 189: 515.

Reich cites 9 cases to illustrate the diagnostic value of sternal puncture in obscure blood dyscrasias. In some cases it may be the only clinical method of arriving at a correct diagnosis. The method of obtaining bone marrow for study was simple and could be repeated almost as frequently as the ordinary examination of peripheral blood. The instrument used for obtaining marrow was a special needle, very similar to that used for lumbar puncture, except for a guard which prevents it from being inserted too deeply. When the stylette is removed after the needle is *in situ* marrow fluid can be aspirated by attaching a syringe to the end of the needle.

The actual technique of marrow puncture employed by Reich is as follows. A small area of

skin overlying the sternum opposite the third interspace is painted with iodine, and novocain is injected into the skin, underlying tissues and periosteum. The needle is then inserted and 10 c.c. of bloody fluid aspirated and mixed with 2 c.c. of a 1.4 per cent sodium oxalate solution. This mixture is then centrifuged and smears made of the buffy coat. The smears are stained by Jenner-Giemsa stain and a differential count of a thousand cells made. The method is said to be painless, can be repeated frequently, and is without danger to the patient.

E. S. MILLS

### Obstetrics and Gynæcology

#### The Treatment of Obstetric Disproportion.

Brown, R. C., *Brit. M. J.*, 1935, 1: 1251.

Every patient should be subjected to a vaginal examination and have her diagonal conjugate measured. Patients in whom the true conjugate measures  $3\frac{3}{4}$  inches or more will probably deliver themselves by the natural passages at term, provided that the fetus is of normal size; where the true conjugate measures less than  $3\frac{1}{4}$  inches they will probably require Cæsarean section. Patients in the middle group offer the greatest difficulty in forecasting the result of labour.

The factors concerned in the delivery of a woman are, (a) those recognized before the onset of labour: size of pelvis, size of the fetal head, the general build of the patient, age, mobility of pelvic joints; and (b) those recognized after the onset of labour: presentation, progress of the first stage, the force of uterine contractions, the fortitude of the patient, and the moulding of the head. No correct decision as to the outcome of labour can be given until labour is in progress. The primipara with minor disproportion should be allowed to go into spontaneous labour at term, and the decision of the obstetrician reserved until he has observed the patient at labour and the fetal head acting under the force of the uterine contractions. A trial of labour may terminate (1) normally, *i.e.*, by spontaneous delivery or with low forceps, (2) by Cæsarean section or, (3) by delivery of a fetus, intact but dead, by means of the forceps. The practice of a trial of labour in primiparæ may be used as a method of classifying the patients themselves into three groups; (a) patients in Group 1 above could be safely left to deliver themselves in future, (b) patients in Group 2 will always require Cæsarean section, (c) patients in Group 3 should be delivered by the conduction of premature labour on future occasions.

Induction of premature labour for disproportion has no place in the delivery of a primipara. Induction of premature labour is a useful method in the delivery of a multipara where a

record of the history of former labour has been carefully kept and can be used as a guide to the capacity of the patient to deliver herself. Where induction of premature labour is practised in a primipara it may be done unnecessarily, and there is little to prevent this error being repeated in future pregnancies.

ROSS MITCHELL

### Ophthalmology

#### Physiological Considerations in the Treatment of Pulsating Exophthalmos. Dorrance, G. M. and Loudenslager, P. E., *Am. J. Ophthalmol.*, 1934, 17: 1099.

The physiological and pathological considerations involved in the management of pulsating exophthalmos include the mechanism of the carotid sinus, the rôle of the sympathetics, the factors of thrombosis, and of embolism, and the anatomical details of collateral circulation.

Treatment by ligation of the common carotid artery, subsequently by ligation of the external carotid, reduces the flow in the internal carotid by 50 and 75 per cent, respectively. When the pressures within the internal carotid are not reduced too greatly, there is no tendency to reversal of blood flow from the distant portion of the carotid backward through the fistula. The reduction of the blood flow is followed by contraction of the lumen of the vessel and favours the reduction in the size of the fistula. Drainage of operation wounds in the neck is specially considered for the avoidance of operative complications.

S. HANFORD MCKEE

#### An Atypical Case of Mikulicz's Syndrome.

Marquez, M., *Ann. d'Ocul.*, 1934, 171: 641.

This report deals with an atypical case of Mikulicz's syndrome, in which there existed large swelling of the two lachrymal glands, some of the glands of Krause, the parotid glands, particularly on the left side, and a part of the submaxillary glands. Removal of the lachrymal tumours was carried out, and radiotherapy was applied to the operative field as well as to the other glands not removed. The histological study of the material showed lymphoid tissue without a vestige of glandular structure. The author enlarges on the anatomo-pathological aspect of lymphoid infiltration and of lesions in obscure parts which produce it or favour its production.

S. HANFORD MCKEE

#### Internal Fistulation by Sclero-ciliary Iridencleisis in Glaucoma. Del Barrio, A., *Ann. d'Ocul.*, 1934, 171: 977.

The objections to sclero-iridectomy, because of the late infection, estimated at 5.5 per cent of the cases, has prompted Del Barrio to offer

the above operation as a substitute. The iridencleisis of Holth is open to the same criticism. Cyclodialysis would be the ideal operation if the results were permanent, but this is rarely the case. Internal iridencleisis corrects the deficiency of cyclodialysis and establishes a permanent communication between the anterior chamber and the suprachroidal space, converting this into one channel covered with epithelium.

It is an operation of easy technique. It is devoid of all primary or secondary complications and is of more value than sclero-iridec-tomy. It is indicated in all types of glaucoma. Even in the acute cases, although the author has not performed it in any of this type, it is absolutely without danger and may even be attended with less risk than simple iridectomy. In the present state of surgical therapeutics for glaucoma we should not use the older methods of operation unless iridencleisis has failed. There are five illustrations and an extensive bibliography.

S. HANFORD MCKEE

#### **Conjunctivitis from *Bacillus Proteus Vulgaris*.**

Nizetic, Z., *Ann. d'Ocul.*, 1934, 171: 998.

The proteus bacillus has not been considered a pathogenic agent, though recently certain writers have attributed pathogenic action to it. It has even been claimed as the cause of a septicæmia. Axenfeld and a number of other writers are mentioned to show that nowhere has the writer been able to find any pathogenic action of the proteus vulgaris in the eye. On this account he publishes in detail the story of a conjunctivitis in a patient 26 years of age who had been under numerous oculists before being observed.

S. HANFORD MCKEE

#### **Ocular Pemphigus.** Ryecroft, B. W., *Brit. J. Ophthalmol.*, 1934, 18: 571.

Ocular pemphigus has been established as a clinical entity since 1858, when White Cooper described a case. Subsequent to this date the exact pathological differentiation of the condition occasioned dispute amongst dermatologists and ophthalmologists until von Graefe, in 1879, identified pemphigus with what had hitherto been called "Essential shrinking of the conjunctiva".

Among eye cases pemphigus occurs in 1 per 20,000, and among skin cases in 1 per 300. Ocular pemphigus attacks the lids, conjunctiva, and cornea, the clinical picture often being composite. As the name implies, vesiculation should be a dominant factor of pemphigus, but it is a feature which is rarely seen in the ocular type. The disease might be said to pass through three stages, namely, vesiculation, cicatrization, and the final stage of complica-

tions. The vesicles, which may occur either on the palpable or bulbar conjunctiva, vary from the size of a pea to that of a bean. The site of election is at the inner canthus and at the centre of the lower conjunctival fornix. In other cases shallow ulcers have been noted in these situations, and in still more cases no ulceration or vesiculation has been found. The lower lid tends to be attacked more often than the upper. Vesicles have not been described as occurring on the cornea, and it appears that corneal changes are secondary. Adams stresses the fact that vesiculation alone is not the important factor in the formation of subsequent cicatrices, but that epithelial hypertrophy and subadenoid infiltration are more potent causes.

S. HANFORD MCKEE

### **Urology**

#### **The Dynamic Hydronephroses and Sympathectomy of the Ureter.** Caporale, L., *J. of Urol.*, 1935, 33: 83.

A series of experiments offered by the author suggests an important explanation of the dynamics theory of hydronephrosis, a theory which until very recently was based on a hypothesis which was never proved. The conclusion to be drawn from all these facts is that segmentary sympathectomy of the ureter will produce, primarily, an atony in the tract itself, and, secondarily, a gradual peri-ureteral atony which culminates in a progressive hydro-uretero-nephrosis. The clinical application of this theory lies in the precautions one must practise in operations necessitating exposure of the ureter, to preserve the adventitia of the organ.

V. J. BERRY

#### **Solitary Renal Cysts; Their Symptoms when Situated at the Upper Pole of the Right Kidney.** Quinby, W. and Bright, E., *J. of Urol.*, 1935, 33: 201.

A solitary cyst of the upper pole of the right kidney is a rare occurrence, and must be considered in the differential diagnosis of the cause of pain in the right upper quadrant of the abdomen. Especially is this true in those cases where the gall bladder has been found to be normal by cholecystographic studies.

The symptoms usually excited by such a tumour are pain in the right upper quadrant of the abdomen under the costal margin, less frequently referred to the loin. Occasionally, infection supervenes and symptoms of pyelitis and cystitis complicate the diagnosis. Gross hæmaturia has been reported in about one-quarter of the cases. Rarely does one palpate any tumour and at least two-thirds of the cases present normal findings on physical examination. Pyelography is the most accurate means of diagnosis of a solitary cyst of the kidney. Four cases are cited.

V. J. BERRY

**The Effect of Morphine upon the Human Ureter.**

Ockerblad, N. F., Carlson, H. E. and Simon, J. F., *J. of Urol.*, 1935, 33: 356.

The authors' survey of the literature of the world as it relates to the effect of morphine upon the intact human ureter is somewhat disappointing, for the generally held notion as to the action of this drug upon the urinary duct does not coincide with the pharmacology of morphine which has been established in the research laboratory. Their observations are based upon a study of 24 normal human beings and the results recorded by means of hydrophorographic tracings of Trattner. The conclusion was that morphine, given subcutaneously in the usual clinical doses, caused a marked increase in ureteral tone and amplitude of contractions; the larger the dose, the greater the effect. The effect is produced by morphine in 2 to 5 minutes and persists for at least 3 hours. Atropine in doses of 1/100th of a grain invariably wipes out the contractions of the morphine-stimulated ureter, with a consequent loss of tone. This effect is not so striking or constant as when it is given alone.

V. J. BERRY

**Primary Endometriosis of the Urinary Bladder.**

Henrikson, E., *J. Am. M. Ass.*, 1935, 104: 1401.

Primary endometriosis of the urinary bladder is quite a rarity. The author quotes 30 cases from the literature, but of these only 21 belong to the so-called primary group.

The genesis of endometriosis, as well as its mode of dissemination, is still unsettled. Numerous theories have been advanced. The more generally accepted are that their origin is from normal endometrial tissue of the genital tract, either by proliferation of continuity, lymphogenous metastases, or by retrograde menstruation. They may originate from embryonic remnants in the genital tract (Wolffian or Müllerian ducts), or by metaplasia of the serosal endothelium. The author feels that the term "primary vesical endometriosis" should be limited to that group in which no demonstrable continuity exists between the bladder, uterus, tubes, or ovaries, and there has not been any previous surgical shock to the bladder.

The youngest patient reported was 19 years, but the most common age decade was between 35 and 45 years. The location of the tumour is usually the floor of the bladder between the ureteral orifices. The appearance very much suggests sessile carcinoma except for its nodularity.

The symptoms in the majority of cases were, frequency, dysuria, and hæmaturia, which appear several days prior to menstruation, persist during the flow, and generally continue for a day or even a week after its cessation. This triad, when supported by bimanual palpation of

a tumour mass, is practically pathognomonic of vesical endometriosis.

The treatment advocated is complete excision in young women; castration, either by operation or irradiation, in women near the menopause, or where the lesion is too extensive and the general condition contraindicates major surgery.

V. J. BERRY

**Neurology and Psychiatry**

**Relation of the Conditioned Reflex to Psycho-analytic Technique.** Kubie, L. S., *Arch. Neurol. & Psych.*, 1934, 32: 912.

The author's contention is based on Pavlov's statement that "synthesis, i.e., association, may take place when the cortex is in a state of inhibition due to the presence of a focus of strong excitation. Although this synthesis takes place outside the field of consciousness, it may, under favourable circumstances, enter that field (of consciousness) as a seemingly spontaneously formed link." This observation is correlated with one of the earliest observations of Breuer and Freud that a focus of strong excitation may give rise to a state of generalized inhibition during which certain strong associative links may be formed in the inhibited field.

It must be realized that the conditioned stimulus is always a signal of "something to follow". Further, that something to follow must gratify some instinctual desire. The animal must be in a state of instinctual tension and the stimulus must always have preceded the gratification and be a signal of its approach. Now, even exciting stimuli produce inhibition of two kinds. First, of those portions of the cortex not immediately involved and, secondly, during the lag between stimulus and response, inhibition of the entire cortical field. Further, if the stimulus be such that the animal has learnt that nothing is going to occur, the inhibition, first patchy and then generalized, leads to sleep. All stimuli then, whatever their specific effect, inhibitory or excitatory, produce certain inhibiting effects, particularly those stimuli which produce no effective response. The implications are fairly obvious—the more "stimulating" or forceful, the psychiatrist, the more he tends to produce states of inhibition. Hence the passivity so stressed in analytic technique would appear to have some physiological basis. Each association leads to further association (*les atomes crochus*) in the absence of external inhibitions.

It seems therefore that the observer who keeps himself in the background and merely strives to facilitate free flow of thought and expression is carrying out a classic experiment on conditioned reflexes by reducing external stimulation, i.e., inhibition, to a minimum and permitting unconscious synthesis to enter field of consciousness. He depends on temporal relation between two associations for link and not on logical connec-

tion. Any two ideas linked together in sequence, by virtue of the fact alone *must* have a dynamic association. This deduction apparently is based on sound scientific evidence.

G. N. PATERSON-SMYTH

**Herniation of the Nucleus Pulposus.** Peet, M. M. and Echols, D. H., *Arch. Neur. & Psychiat.*, 1934, **32**: 924.

Two cases are reported of patients with nodules on the intervertebral discs producing symptoms of tumour of the spinal cord. Both patients recovered following surgical excision of the nodule. The authors point out that half of the fifty odd cases previously reported in the literature have been diagnosed chondroma or fibrochondroma. Most of these reports were made before the work of Schmorl and others on the intervertebral discs was generally known.

Each intervertebral disc at its circumference is composed of laminae of dense fibrocartilage forming the annulus fibrosus. The fibres run obliquely from one vertebra to the next and are firmly attached to them. The nucleus pulposus, an incompressible, semigelatinous mass, is found near the centre of the disc. Interposed between the disc and the adjacent vertebrae are thin plates of hyaline cartilage. The nucleus pulposus, confined to its position by the elastic annulus fibrosus and the two cartilage plates, acts as a shock absorber for the spine. Local degeneration or trauma may produce a minute fissure in the annulus fibrosus or in the cartilage plate. In each instance the nucleus pulposus, which is always under pressure, herniates through the defect. The fissures which develop in the annulus fibrosus are usually situated posteriorly. Consequently the prolapsing nuclear substance enters the spinal canal, where it forms a swelling under the posterior longitudinal ligament, usually to one side of the midline. These extrusions are common, but are usually too small to produce compression of the spinal cord.

FRANK A. TURNBULL

### Therapeutics

**Lobar Pneumonia and Digitalis.** Cohn, A. E. and Lewis, Jr., W. H., *Am. J. M. Sc.*, 1935, **189**: 457.

Cohn and Lewis Jr. have made an analysis of 1,456 cases of lobar pneumonia to ascertain what influence the action of digitalis has on the course of this disease. The cases were divided into groups by selecting the uncomplicated ones and separating them from those having one or more unfavourable factors or complications. These groups were analyzed separately. The authors' conclusion is that digitalis does not influence the course of events in lobar pneumonia. How-

ever, they found its action to be beneficial in certain cases when auricular fibrillation and auricular flutter occurred. The outcome in lobar pneumonia was found to depend largely upon such factors as the presence of bacteriæmia, the type of pneumococcus, the number of pulmonary lobes involved, and the existence of complications. The giving of digitalis rarely if ever precipitated an attack of auricular fibrillation, and heart block did not occur unless unusually large doses of the drug were prescribed.

E. S. MILLS

**Bacillary Dysentery—A Summary of Treatment.** Horner, H. W., *Brit. M. J.*, 1935, **1**: 1162.

The toxæmia and orderly sequence in clinical events make bacillary dysentery distinguishable from the many miscellaneous entities with this symptom. Cases may be mild, severe or fulminating; in the Shiga type toxæmia is early and causes peripheral circulatory collapse, if severe.

The principles of treatment are: improvement of tissue nutrition; increase of blood volume in terms of venous return; conservation of body fluids, heat and energy. A preliminary purge with castor oil and tincture of opium is advised if the case is early. Serum is considered the most valuable single therapeutic agent, and should never be omitted except in the mildest cases. A dose of 40 to 80 c.c., intramuscularly, is advised, repeated next day if necessary. Bacteriophage is not advised, as it has proved disappointing in practice.

Sodium sulphate, 1 drachm to 1 ounce of water, is given two-hourly, the first, and four-hourly, the second and third day. Later, it is dropped to a single morning dose. The patient is urged to drink water, and is fed every two hours with chicken broth, arrowroot, etc. No milk preparations are used. Custards, eggs, etc., are soon added. There may be temporary intolerance to certain foods and traces of blood may be expected.

Pain must be relieved, but not by morphine. Tenesmus is controlled by hot water injections, anal pain by atropine suppositories, strangury by belladonna and alkalies, general abdominal pain by radiant heat.

Five per cent glucose in saline intravenously is indicated in all severe cases. In marasmic cases it must be given very slowly and continuously. Enemas of plain tap water at blood temperature are the best local treatment; sometimes suspensions of kaolin or charcoal are helpful. Complications, such as iritis or arthritis, require special treatment.

The mortality rate in severe dysentery is 40 to 60 per cent but by careful and timely application of proved measures it may be

brought down to 10 per cent or less. In an Iraq epidemic of 92 cases (Royal Air Force), of which 31 were severe, the death-rate was only 3.25 per cent.

W. FORD CONNELL

### Dermatology

**Fractional Gastric Analysis in Diseases of the Skin: Further Observations in 316 Cases with Special Reference to Rosacea.** Brown, W. H., Smith, M. S. and McLachlan, A. D., *Brit. J. Dermatol. & Syphilol.*, 1935, 47: 181.

Following up the work of Ryle and Barber and of Brown on fractional gastric analysis in rosacea as compared with individuals without rosacea, the authors found that in 28 per cent of 150 cases of rosacea there was complete achlorhydria or marked hypochlorhydria; cases other than rosacea showed 38 per cent with complete achlorhydria or marked hypochlorhydria in 166 cases. Thus, the percentage is lower in the rosacea group, which is contrary to the prevalent belief.

Repeated gastric analyses were done in a series of 41 cases, some of these being done over a period of two years. The prominent feature of this part of the study was the tendency for gastric findings to remain the same although the clinical condition improved. Attention was directed to focal sepsis in teeth and tonsil, scalp oiliness and scaliness, menstrual disturbance, and to the presence or absence of gastric disturbance. Fifty-one per cent of the patients showed focal sepsis in teeth or tonsils; 55 per cent had an excessively oily or scaly scalp; menstrual disturbance was present in only 20 per cent; gastric disturbance was present in 61 per cent, being practically constant in the hypochlorhydric group.

The authors conclude that marked gastric sub-acidity is not a feature peculiar to rosacea as has been thought, but of chronic dermatosis in general. However, strict dietetic control in combination with large doses of dilute hydrochloric acid does bring about marked improvement in rosacea.

N. M. WRONG

**Some Constitutional Dermatoses.** Ingram, J. T., *Brit. M. J.*, 1935, 1: 877.

The author believes that many of the commoner dermatoses, including infantile eczema, seborrhœic eczema, and rosacea, are but the response of individuals with a certain constitutional "make-up" to certain environmental factors which produce no such reaction in the majority of people.

Infantile eczema occurs only in temperamentally sensitive infants at 2 or 3 months, and starts as an itching provoked by exposure. The eruption, usually facial, is provoked by rubbing,

and has a mask-like distribution. Teething, gastro-intestinal upsets, etc., provoke exacerbations, but are never the sole primary cause. The author finds that these infants usually have temperamentally unstable mothers and thrive best when not breast fed. Rest and quiet for the first year is the main essential. A mild tar ointment relieves itching; bromide may be given up to 15 grains daily.

Cases of seborrhœic eczema and sycosis are common in children at about 7, at puberty, and at the menopause. Besides the skin manifestations, these patients also have flabby œdematous mucous membranes and consequently develop infected sinuses, enlarged tonsils and adenoids, polypi, pyorrhœa, dental sepsis, flatulent dyspepsia, constipation, poor digestion with faulty assimilation of iron and vitamins and consequent nutritional anæmias. Local skin remedies alone are useless; general treatment with eradication of septic foci gives excellent results.

Persons whose faces flush easily are prone to develop rosacea. Usually there is a constitutional background of emotional sensitiveness, combined with some increased mental anxiety. Sometimes the exciting factor may be a flatulent hypotonic dyspepsia, or, in women, some pelvic disturbance. Local sepsis in nose or throat may provoke flushing. All these considerations require attention before response to local treatment will be good. In many other skin conditions, constitutional factors are of equal importance, and deserve more careful study.

W. FORD CONNELL

### Hygiene and Public Health

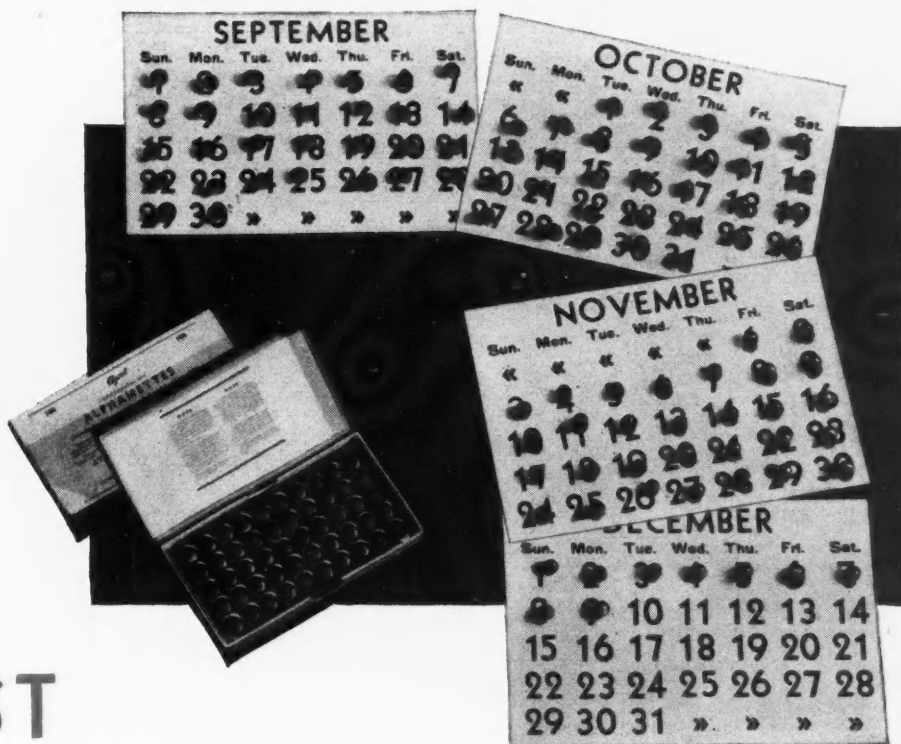
**Classroom Odours with Reduced outside Air Supply.** Houghton, F. C. *et al.*, *Heating, Piping & Air Conditioning J.*, 1935, 7: 247.

From the standpoint of oxygen requirement and carbon dioxide elimination the outside air requirement per person in the conventional schoolroom is probably between 2 and 4 cu. ft. per minute. This is nearly always available through infiltration without any special provision for ventilation. It is doubtful, however, whether this very small amount of outside air is sufficient to keep down objectionable odours.

The authors found that in a classroom of conventional size air leakage and the initial room air volume was found to give an air change of from 1 to 1½ per hour or an air supply per person in the rooms studied of from 2 to 5 cu. ft. per minute.

Under such conditions odours occur which are little noticed by the occupants but are noticeable to someone entering the room from outside. In order to prevent noticeable odours it was necessary to supply air at the rate of 11 cu. ft. per minute. Obviously this figure depends on several variables.

FRANK G. PEDLEY



# THE LAST

# HUNDRED DAYS

"The relationship between an adequate supply of vitamins and normal pregnancy is fairly definite. . . . It seems almost imperative to add some form of cod liver oil to the diet of an expectant mother. . . . Many of these patients cannot tolerate fats in any form. In such cases cod liver oil concentrates may be used." (C.M.A.J., 1934, 31: 521).

Alphamettes, containing standardized concentrate of defatted cod liver oil,\* provide a simple and definite ante-natal prophylaxis. One capsule each day for the last 100 days aids in protecting the mother against infections of the puerperium and builds a reserve of vitamins A and D to enrich the breast milk.

\* Each Alphamette capsule exhibits the complete vitamin value of 3 teaspoonfuls of cod liver oil conforming with requirements of the U.S.P. X (Revised 1934).

# ALPHAMETTES



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CANADA

## Obituaries

**Dr. Henry Merrill Barrett**, of Mt. Elgin, Ont., died on March 18, 1935, in his forty-sixth year. He had been confined to bed for six weeks on account of cardiac insufficiency, a trouble which dated back to the time of his medical service in the Great War. Enlisting in 1915 with the R.A.M.C. at London he served overseas until May, 1919, winning the Military Cross.

For the past 14 years Dr. Barrett practised in Mt. Elgin, where he won the esteem of his medical confrères and the whole countryside. He was secretary of the Mt. Elgin library board and a Past-Master of Dereham Lodge, A.F. and A.M. He was an ardent lover of the gun. Each autumn he went north with the hunters.

Besides his mother, Mrs. Robert Barrett of Dereham, he is survived by his widow, formerly Miss Jessie Brooks, of Beachville, and four children, Robert, William, May and Barbara. The late Dr. Barrett was a graduate of the University of Western Ontario (1912).

**Dr. John Locke Churchill**, Superintendent of the Nova Scotia Hospital, Dartmouth, N.S., died in his sleep during the night of June 21, 1935, from a heart attack. Although it was known to a few that Dr. Churchill did not enjoy the best of health his death came as a distinct shock. Dr. Churchill was born at Lockeport, N.S., in 1872. He first graduated from Acadia University, and from there went to study medicine at McGill. After graduating from McGill (1896) he took post-graduate study in New York and first started practice at Bridgewater. Following a successful practice there Dr. Churchill came to Halifax, where he immediately took a great interest in civic affairs, particularly in public health matters. He was Chairman of the Board of Health of the City of Halifax, from which position he retired in 1923. He also served as a member of the Faculty of Medicine of Dalhousie University, lecturing on contagious diseases. Next to his profession, probably his greatest love was literature; he was well versed in the classics and particularly fond of poetry. Surviving him are his widow, formerly Miss Charlotte MacMillan, of New Glasgow; and one daughter, Mrs. Frank H. Curry, of Halifax.

**Dr. Elzéar Laberge** died on June 1, 1935, at the age of 77. He was born at St-Roch-de-Québec, and studied at the seminary of Quebec before taking up medicine at the University of Laval, where he graduated in 1882. He started practice at St-Roch where he soon built up a large connection, and later became superintendent of the Marine Hospital. He led a very busy life in public affairs, but always refused to be a candidate for any political party.

**Dr. Ivar Lefstrud**, of Viking, Alberta, died on July 15, 1935, from injuries sustained when, in response to a call, the speeder upon which he was riding was thrown from the railway track. The accident took place in the mining district west of Edmonton. He was thirty-four years of age and a graduate of the University of Alberta in 1931. He was highly esteemed by those who knew him.

**Dr. Robert Roy McClenahan**, died at Christie Street Hospital, Toronto, on July 19th. Dr. McClenahan was a graduate from the University of Toronto (1912) and a captain in the C.A.M.C.

**Dr. John Standish McCullough**, of Orillia, died at the Collingwood Hospital, on July 25th, in his 82nd year. He was M.D. of Trinity University (1884).

**Dr. Thomas Holmes Middlebro**, died at his residence in Owen Sound on July 16th aged 72 years. He was a graduate of 1892 of the University of Toronto.

**Dr. James Joseph Morrow** died at St. Joseph's Hospital, Toronto, on July 11th. Dr. Morrow received his medical education at McGill University, from where he graduated in 1900.

**Dr. John E. L. Pollard**. It is our sad duty to record the death of Dr. Pollard, of Hantsport, N.S., who passed away on June 20, 1935. Until a few days before his death Dr. Pollard had been enjoying good health and his death came as a shock both to his family and relatives. Born seventy-two years ago in Lancashire, England, Dr. Pollard was educated at London and Edinburgh Universities, and first practised his profession in England. He came to Canada in 1923 and settled at Hantsport. Dr. Pollard took a keen interest in sport, particularly in cricket, and was associated for a number of years with the Windsor Eleven, of which his son was a member. He is survived by his wife, one daughter living at Hantsport, and one son, a member of the Royal Canadian Mounted Police, stationed at Halifax.

## News Items

### Great Britain

#### British College of Obstetricians and Gynaecologists.

—At a meeting of the Council held on July 13th the following named Canadians were admitted to the College:

To the Fellowship: Dr. L. C. Conn, Edmonton.

To the Membership: Dr. W. G. Cosbie, Toronto; Dr. D. M. Low, Toronto; Dr. G. R. Sparrow, Toronto; Dr. H. B. Van Wyck, Toronto.

**The Katherine Bishop Harman Prize.**—The Council of the British Medical Association is prepared to consider an award of the Katherine Bishop Harman Prize, of the value of £75, in the year 1936. The purpose of the prize is the encouragement of study and research directed to the diminution and avoidance of the risks to health and life that are liable to arise in pregnancy and child-bearing. The Prize will be awarded for the best essay submitted in open competition, competitors being free to select the work they wish to present, provided this falls within the scope of the prize. Any medical practitioner registered in the British Empire is eligible to compete.

Should the Council of the Association decide that no essay submitted is of sufficient merit, the prize will not be awarded in 1936, but will be offered again in the year next following this decision, and in this event the money value of the prize on the occasion in question shall be such proportion of the accumulated income as the Council shall determine. The decision of the Council will be final.

Each essay must be typewritten or printed in the English language. It must be distinguished by a motto, and accompanied by a sealed envelope marked with the same motto, and enclosing the candidate's name and address.

Essays must reach the Medical Secretary (to whom inquiries may be addressed), British Medical Association House, Tavistock Square, London, W.C.1, not later than December 31, 1935.



## A Limping Child

Often there is little or no complaint of pain. Yet something is definitely wrong. Possibly it is Perthes' disease (osteochondritis deformans juvenilis).

Clinically, this disease, in children 5 to 10 years of age, may be mistaken for tuberculosis. But your radiologist can make a differential diagnosis.

In other bone or joint affections as well, an x-ray examination will materially facilitate correct diagnosis:

**Osteomyelitis**  
**Tuberculosis      Fractures**  
**Cnarcot's disease      Joint cysts**  
**Osteo-arthritis**

Consult your radiologist in every case where symptoms indicate bone or joint pathology. Radiographs are essential to prompt, accurate diagnosis.

**CANADIAN KODAK CO., LIMITED**  
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# Radiographs Provide Diagnostic Facts

The William Gibson Research Scholarship of the Royal Society of Medicine has been awarded to Dr. F. Stephen-Lewis of the University of the Witwatersrand, Johannesburg. Dr. Stephen-Lewis proposes to carry out a research on "Further study in the chemistry of South African plants, particularly those used by the natives as medicines", and "Investigation of physiological data for the various native tribes".

### Alberta

The Alberta Official Gazette announces that the Provincial Commission to inaugurate the Health Insurance scheme as planned in the Act has been appointed as follows: *Chairman*, Hon. Geo. Hoadley, Minister of Health, Edmonton; *Vice-Chairman*, Dr. A. E. Archer, Lamont, Alta.; Dr. M. R. Bow, Deputy Minister of Health, Edmonton.

It is stated that for the time being these appointees are to serve without salary.

The Province of Alberta is being organized medically into District Associations, and at the present time all but the Peace River District has been organized. The President, Dr. D. S. Macnab of Calgary, has been planning to visit this last district and on three different occasions, meetings have been called only to be cancelled on account of the embargo placed on traffic due to the water damage to the railway tracks in the vicinity of Lesser Slave Lake. The banks of this lake are very low and at the east end much muskeg land exists. With the rise in the lake water and northwest winds, 75 additional square miles have been inundated.

The second quarterly issue of the *Alberta Medical Bulletin* has been published and contains a number of interesting contributions, by Hon. George Hoadley on "Public Health"; by Dr. G. R. Johnson on "The Canadian Medical Association Meeting"; by Dr. H. C. Rankin "The Provincial Medical School, University of Alberta Faculty of Medicine"; by Dr. M. R. Bow on "The cost of preventable sickness and death"; by Dr. A. H. Baker on "Facilities for the treatment and diagnosis of tuberculosis in Alberta"; by Dr. C. H. Baragar on "The mental health service of Alberta"; by Dr. G. M. Little, D.P.H., on "Red Deer full time health district"; and by Dr. J. K. Fife, Edmonton, on "Small medical groups or reporting clubs".

Among the speakers at the annual meeting of the Alberta Medical Association on September 16th, 17th and 18th will be Professor J. C. Meakins, Montreal, Dr. R. I. Harris, Toronto, and Dr. W. V. Cone, Montreal. An interesting program has been prepared for this meeting.

G. E. LEARMONTH

### British Columbia

The Tuberculosis Conference held in Vancouver under the direction of Dr. W. H. Hatfield, on July 8, 9 and 10, 1935, marked the opening of a new stage in the progress of tuberculosis prevention and control in British Columbia. The conference received good attention in the daily press, each day's proceedings being well reported. The attendance was about 75, and included representatives of all provincial and municipal departments, the medical profession, social-workers, nursing-groups and hospitals, as well as others interested.

The agenda for the sessions, which were held daily at 9 a.m. and 2 p.m., covered every possible feature of anti-tuberculosis activity, and as a result existing deficiencies and needs became readily apparent, steps to overcome them were devised, and new plans for further development were laid. One of the first of the latter

to be proceeded with is the new tuberculosis building, to be commenced immediately on the premises of the Vancouver General Hospital.

Two well-merited honours have been paid to Dr. H. E. Young, the veteran Provincial Health Officer. On June 15th he was elected at Atlantic City as president of the State and Provincial Health Officers' Association, and on July 2nd he was elected president of the Western Branch of the American Public Health Association at the convention held in Helena, Montana.

D. E. H. CLEVELAND

### Manitoba

Alderman Herbert Andrews, Chairman of the Relief Committee of the City of Winnipeg, was instantly killed on the night of August 7th, when struck down by a motor car. Mr. Andrews was a member of an Allan Cup team and was prominent in legal and civic circles. He was chairman of the Relief Committee when the arrangements between the City and the medical men of Winnipeg was reached which provided for payment by the city for medical care of those on relief. Much of the credit for the success of the negotiations between the city's representatives and the doctors and for the smooth working of the scheme was due to the statesmanlike attitude of Mr. Andrews and his continued interest to the welfare of the unemployed of the city.

A party of 150 medical men and women from Great Britain on their way to the annual meeting of the British Medical Association in Melbourne, passed through Winnipeg on August 7th.

Dr. Brian D. Best has begun practice at Killarney with his father.

Dr. J. L. Jackson, Assistant Professor of Anatomy in the Medical Faculty of the University of Manitoba, has tendered his resignation on being appointed Professor of Anatomy in the University of Saskatchewan to succeed the late Professor McGibbon. Dr. Jackson recently published studies in the development of the human aorta. He will be greatly missed both by his associates and by the students.

Hon. I. B. Griffith has been appointed Minister of Health and Public Welfare in succession to Hon. R. A. Hoey, who for a time had held that portfolio as well as being Minister of Education.

A post-graduate week will be held at Manitoba Medical College September 9 to 14. The program has been arranged by the Faculty of Medicine, University of Manitoba, with the cooperation of the Department of Health of Manitoba and the Manitoba Medical Association, and has been planned for the benefit of officers of health. Visiting speakers will be Dr. J. J. Wall, Director of Trachoma Control, Department of Indian Affairs, Federal Government; Dr. Wherritt, Secretary of the Canadian Tuberculosis Association; Dr. W. H. T. Mitchell, Mental Hygiene Institute, Montreal; Professor J. C. Meakins, McGill University; Dr. R. I. Harris, University of Toronto and Dr. W. V. Cone, Neurological Institute, Montreal.

ROSS MITCHELL

### Nova Scotia

Dr. H. G. Grant, Dean of the Faculty of Medicine, is at present engaged in carrying out a survey of tuberculosis in certain Cape Breton districts. He will be engaged in this work for the remainder of the summer.



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BIS-MIX does not contain any Sodium Bicarbonate, which is often responsible for chronic gastricatony.

BIS-MIX allays spasmodic pain in acute gastritis.

BIS-MIX is very pleasant to take.

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*Samples available to the medical profession.*



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Dr. S. N. Miller of Middleton recently celebrated his 85th birthday. He is probably the oldest active member of the Nova Scotia Medical Society, and he has been engaged in practice for 60 years. He was a student at the old Halifax Medical College, but completed his course at the New York University in 1875.

Dr. J. A. Sponagle has returned from the Deaconess Hospital, Boston, where he had undergone a serious operation.

Dr. John Stewart, who has been in practice at Upper Stewiacke for several years, has been appointed to the Medical Staff of Camp Hill Hospital, Halifax.

Dr. D. M. Cochrane, of River Hebert, was nominated a candidate for the Conservative Party for Cumberland County to contest the next Federal election.

N. B. DREYER

### Quebec

The party of British and other doctors, on their way to the Annual Meeting of the British Medical Association in Melbourne, Australia, passed through Montreal on August 3rd. They numbered sixty-six. With their families and friends who accompanied them the total number was 141. The *Duchess of Richmond*, of the C.P.R., was about three hours later than her schedule in arriving on account of fog in the Gulf. Dr. J. C. Meakins, President of the Canadian Medical Association, met the party at Quebec, and accompanied them to Montreal. At the dock the visitors were welcomed by Drs. Archibald, Chipman, Scrimger, Bazin, Wesley Bourne, and Beauchamp, the last-mentioned being the Immigration Officer, representing the Dominion Government.

In the party were Dr. S. Watson Smith, of Bournemouth, President of the British Medical Association; Mr. H. S. Souttar, Chairman of the Representative Body, B.M.A.; Mr. L. Ferris-Scott, Financial Secretary and Business Manager, B.M.A.; Senator Sir E. Coey Bigger, of Lisnacran, Ireland; Dr. J. C. Bramwell, of Manchester; Mr. McAdam Eccles, London; Mr. J. S. Fairbairn, London; Dr. C. H. Hart, Bulawayo, S. Africa; Dr. H. O. Hofmeyr, Cape Town, Africa; Mr. S. T. Irwin, Belfast; Mr. F. G. Pybus, Newcastle-on-Tyne; Dr. Nan Roberts, Arras, France; Dr. W. Robertson, Guernsey; Sir William Willcox, London; Prof. K. Herman Bouman, of Amsterdam.

Professor Bouman is a Corresponding Member of the B.M.A. and is travelling through Canada to get an idea about medical progress in this country and to make contacts with his British confrères. He will leave the party, on the return journey at Macassar, Dutch East Indies, and will work at anthropology, a subject in which he is much interested.

After luncheon at the Windsor Hotel the party was taken for a drive round the city and then proceeded to St. Bruno, where they were delightfully entertained by Mr. and Mrs. W. M. Birks at their country house. Fortunately the weather was ideal for outdoor entertainment. On Saturday night they left on the special train for Niagara Falls. The party travelled on the *S.S. Assiniboine* to the head of Lakes, there to entrain again for Vancouver. At the latter port they went aboard the Canadian Australian liner *Aorangi*, for Australia. The sixty other members of the party who were also headed for Melbourne, were to join them at San Francisco, where the *Aorangi* is making a special call.

### Saskatchewan

No corner of Saskatchewan is too remote to be visited by the Saskatchewan Anti-Tuberculosis League's doctors. Last winter Dr. C. H. Andrews, of Prince Albert Sanatorium, visited some of the tuberculosis outpatients at Ile à la Crosse by plane. The trip was

made possible through the courtesy of R. D. Brooks, of Brooks Airways. The Fairchild cabin plane was used, which was equipped with a Wright whirlwind engine, the same as that which carried Lindbergh across the Atlantic. Skis took the place of wheels.

With the regular mail for the north aboard, the plane took off at 10.30 a.m. It headed north at a height of 2,000 feet. Emma Lake and Waskesiu were picked out from the evergreen carpeted floor that flew beneath, while the new golf course at the latter summer resort showed up as large white strips of dazzling snow set down amid the trees. It went over Grey Owl's beaver sanctuary, Little Trout Lake, Dore Lake, Lake la Plonge, and many others.

Nosing a bit to the left, Beauval Mission on the Beaver River was soon picked up, and they landed on the ice to leave a bag of mail. The new brick school and Roman Catholic seminary, standing there so prominently, recalled the fact that this replaced the Indian School which had burned down a few years ago.

Following the Beaver River north at about 2 p.m., they came to the old post, built on a long point, the church, school, hospital, store and shacks which are Ile à la Crosse. The surrounding land is "free". Anyone who wants wood goes out and cuts down the nearest tree. So, for miles around there are no trees left. When the ground and ice are covered with snow the buildings give the impression of having been built on the ice in the middle of the lake.

The mail was left at the Hudson's Bay Company's post, which was like a grocery store with a special shelf for beads, red blankets, and bright cloth; guns, traps and hardware were stacked in a corner. The Hudson's Bay staff wear official blue caps, after the style of naval officers. Below these caps the costume is a combination of buckskin and Indian bead work.

After lunch with the Royal Canadian Mounted Police Constable, the pilot got a contract to transport a woman and young baby, a man and four dogs, a hundred miles farther up north, to Pachinach on the Churchill River. The entire trip was made at an altitude of about twenty-five feet above the ice, which gave a sensation of great speed. At Pachinach the Churchill River was open, but a landing was made on a narrow strip of ice in front of the Hudson's Bay post. Here, Mr. Belanger, the factor, who has spent forty years in the north, made the party welcome and put them up for the night. The radio that night was a treat; hundreds of miles from any interference, the reception was perfect. An interesting hour was spent inspecting the furs in storage at the post. Beautiful pelts of red, black and cross foxes, mink, otter and timber wolf were seen.

The oil had been drained from the plane's engine and kept warm in the house all night. In the morning the engine was heated up by a blow torch under a tarpaulin cover and then filled with hot oil. It started without a sputter. They flew ninety miles still farther north to the Mudjatick River and landed at a small lake at Old Wives' Rapids, in front of a trapper's cabin, where they picked up his catch of furs, which included thirty-seven red fox pelts. These made a comfortable seat. They flew back to Pachinach for lunch, then south again to Ile à la Crosse and to the hospital. Here fifteen patients were examined and arrangements made for one to be taken to the Prince Albert Sanatorium when the plane made its next trip. This patient was a boy ten years old, who went out later on a stretcher in the same plane as a "Mountie" who was bringing out an insane Indian. The factor's daughter was a passenger on the return trip. She was going to Prince Albert for an appendectomy. She made a successful recovery and returned home in the next mail plane two weeks later.

By the time the examinations were finished the mail was ready for the return trip. Looking down from the clouds the passengers could see numbers of moose and deer in the open glades, but could make out no smaller game.

# BISMUTH THERAPY in SYPHILIS



*A new type of bismuth salts has recently appeared in the field of therapeutics: the oil-soluble salts for intramuscular injection. These constitute a class of products which are rapidly absorbed due to the fact that the bismuth derivative dissolves immediately in the lipoids and does not have to be transformed in situ.*

*Ever anxious to meet all the requirements of the Medical Profession, we are now offering, under the trade name of NEOCARDYL, a compound representative of this new form of liposoluble bismuth.*

*NEOCARDYL has an additional decided advantage over other compounds of its class in that it contains bivalent sulphur combined in its molecule.*

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Ampoules of 1.5 c.c. equivalent to 0.075 Gm. of bismuth metal. Boxes of 12, 50 and 100 ampoules; bottles of 30 c.c.

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### BISGLUCOL

Bismuth metal suspension in isotonic glucose solution.

Supplied in sterilized rubber-capped bottles of 10 c.c. and 25 c.c.

### NEO-LUATOL

Chemically pure Bismuth Hydroxide in oily suspension.

In boxes of 12, 50 and 100 ampoules of 2 c.c.; in bottles of 30 c.c.

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The landing at the air base on the river at Prince Albert was made at 6.30 that night, just as the daylight failed. They had flown as far north of Prince Albert as Regina is south. The landscape is the same rolling, wooded country as that around Waskesiu. Thus modern inventions have made scientific medicine available to those on Canadian frontiers who were previously cut off from civilization.—Abstracted from *The Valley Echo*.

LILLIAN A. CHASE

### United States

A series of about 2,000 tumours of the central nervous system collected by Dr. Harvey Cushing has been installed at Yale University. It is hoped that the collection will be increased by further interesting specimens. The collection is available for study to physicians interested in this type of work. An advisory board has been named to conduct the registry, and Dr. Louise C. Eisenhardt has been named curator of the collection.

### General

taking part in the program which appears on page xxix of the advertising section of this issue. Registration fee of \$5.00 admits all members of the profession in good standing.

**International Medical Post-graduate Courses in Berlin.**—The Berliner Akademie für ärztliche Fortbildung, the successor of the Dozentenvereinigung für ärztliche Fortbildung in Berlin, which is managed by the Chief Burgomaster of Berlin, is holding the following medical post-graduate courses in the autumn of 1935:— (1) Throat, nose and ear course (September 30th to October 12th). Fee 120 RM. (2) Course in infectious diseases (September 30th to October 5th). Fee 40 RM. (3) Internal medicine from the point of view of functional pathology and therapy (October 7th to 19th). Fee 60 RM. (4) The biology of heredity and racial purity in medical practice (October 7th to 12th). Fee 40 RM. (5) Course in tuberculosis in the City of Berlin's Tuberculosis Hospital "Waldhaus Charlottenburg" in Sommerfeld (October 21st to 26th). Fee 50 RM. (6) The surgery of intra-thoracic diseases

### SCHEDULE OF POST-GRADUATE COURSE IN MEDICINE AT ST. MICHAEL'S HOSPITAL, TORONTO

Monday, Sept. 9	Tuesday, Sept. 10	Wednesday, Sept. 11	Thursday, Sept. 12	Friday, Sept. 13	Saturday, Sept. 14
9.30 a.m. The Newer Aspects of Pneumonia and its Complications Dr. J. H. Elliott Dr. E. A. Broughton Dr. G. Cragg	Bronchiectasis Dr. R. T. Smylie	Clinical Anatomy of the Heart Dr. H. G. Hall	Coronary Thrombosis Dr. A. R. Hagerman	Hemiplegia Dr. E. F. Brooks	Diseases of the Liver and Gall Bladder Dr. A. J. MacKenzie Dr. J. Daly Dr. H. Hethrington
10.30 a.m.	Hæmoptysis Dr. J. C. Lyons	Physiology of the Heart Dr. T. G. Heaton	Electrocardiography Dr. D. Prendergast	The Nervous Personality Dr. W. B. Edmonds	
11.30 a.m.	Allergy Dr. E. A. Broughton	Cardiac Pain Dr. J. D. Loudon	Drugs in the Treatment of Heart Diseases Dr. H. McPhedran	Common Skin Diseases Dr. F. A. Ireland	
2 to 4 p.m. Common Diseases of the Eye by Staff of the Eye Department	Common Diseases of the Nose and Throat by Staff of the Ear, Nose, and Throat Department	Ward Rounds by Staff of Heart Unit	Ward Rounds by Staff of Chest Unit	Ward Rounds by the Staff of the Gastro-intestinal and Neurological Unit	Lunch at 1 p.m.

All Physicians and Surgeons are invited to attend these lectures and clinics free of charge. Communications should be addressed to Dr. W. B. Edmonds, Medical Arts Building, Toronto.

**The International Assembly of the Inter-State Post-graduate Medical Association of North America** will be held in the Masonic Temple, Detroit, Mich., October 14th to 18th, with pre-assembly clinics on October 12th and post-assembly clinics on October 19th, in the Detroit hospitals.

An unusual clinical and didactic program including all branches of medicine and surgery and the specialties has been arranged by the program committee. In co-operation with the Wayne County and the Michigan State Medical Societies and other organizations, a most excellent opportunity for an intensive week of post-graduate medical instruction is offered by a very large group of acknowledged leaders in the profession. The president, Dr. C. H. Mayo, will deliver his address, in the afternoon of October 17th. Attention is called to those

with special regard to pulmonary tuberculosis (October 28th to November 1st). Fee 80 RM. (7) Special courses in all branches of medicine, with practical work at the bedside and in the laboratory, are held every month. The fee is 50 to 80 RM. for eight periods of two hours. In these courses special value is attached to practical work; theoretical post-graduate training occupies a secondary position, but is of course not neglected.

For programs and further information apply to the Geschäftsstelle der Berliner Akademie für ärztliche Fortbildung, Robert Koch-Platz 7 (Kaiserin Friedrich-Haus), Berlin NW 7.

Foreign doctors and German doctors resident abroad are granted a reduction of fare of 60 per cent on the German Railways Company's lines; a foreign doctor can reduce the cost of his stay considerably by utilizing what are called "registered marks"; it is advisable to arrange matters with the local bank before starting.

# Staphylococcus Toxoid

for use in the treatment of

## Localized Staphylococcal Infections

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Staphylococcus Toxoid is prepared by incubation of highly-potent staphylococcus exotoxin with formaldehyde until a non-toxic antigen remains.

This antigen as supplied by the Connaught Laboratories has proved to be of value in the treatment and prevention of *localized* staphylococcal infections of various types, such as *boils, carbuncles, pustular acne, recurrent staphylococcal abscesses.*

Staphylococcus Toxoid contains no serum and therefore cannot induce sensitization to any anti-toxin or serum.

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*Prices and information relating to the use of Staphylococcus Toxoid will be supplied gladly upon request.*

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TORONTO 5

CANADA

**The Therapeutic Union**, an international association founded in 1934, will meet in annual convention at the Faculty of Medicine, Paris, on October 9th. Special communications will be: "Our real knowledge in regard to the male hormone", by Associate Professor Guy Laroche; "Splanchnic surgery in arterial hypertension", by Associate Professor René Fontaine, of Strasbourg; "Antimonial compounds in therapeutics", by Dr. J. La Barre, of Brussels. In the afternoon general sessions of the Therapeutic Union and the Paris Therapeutic Society will be held. Among the subjects to be considered will be: "Physico-chemical and glandular equilibrium in the treatment of visceral spasm", by Professor Pende, of Geneva; "The sedative nervous medication of spasm", by Dr. J. Decourt; "Spasmodic substances and their antagonists", by Professor Burgi, of Berne; "The physiotherapy of spasm and visceral pain", by Dr. Delherm.

Membership in the Therapeutic Union may be obtained through Dr. G. Leven, General Secretary, 24 rue Teheran, Paris(8).

**Busts of Koch and Roentgen.**—The Deutsches Museum in Munich celebrated recently the tenth anniversary of its foundation, and opportunity was taken to place busts of Robert Koch and Konrad Roentgen in the chamber of honour. The bust of Koch, which is by Prof. Georg Müller, bears the inscription: "The discoverer of the tubercle bacillus and of other disease producers. In strict logical sequence he showed the ways to effective attack on the diseases that plague mankind." The dedication was made by Ministerial Director, Dr. Gütt. The twenty-fifth anniversary of Koch's death on May 27th has given another German medical weekly occasion for an assessment of his work by the director of the Robert Koch Institute in Berlin. It was Koch, says Dr. Gundel, whose revolutionary genius let in the light to the causes and method of spread of infectious disease. The bust of Roentgen by Prof. Hermann Hahn was presented to the Munich Museum by Prof. Harms in the name of the University of Würzburg; the inscription runs: "The rays which bear his name show the physician the interior of the living body; they show the engineer the interior of his working materials; they have given the scientist a knowledge of the inner structure of the atom." The German Chemical Society proposes to present to the Museum memorial busts of F. Wöhler and Adolph v. Baeyer.—*The Lancet*, 1935, 1: 1340.

**Registered Nurse Wins \$1,000.00 Prize.**—For writing a short letter telling "Why I use and prefer Palmolive Soap", Miss E. B. Cuming, Summerberry, Sask., will receive one of the 20 grand prizes given away in the Palmolive Soap contest. The winners had the choice of a 34-day tour on the world's largest ship, the *S.S. Normandie*, or \$1,000 in cash. Miss Cuming preferred the cash. Following is a letter received by the company from Miss Cuming.

"Your name was given to me by your representative, Mr. Sheppard in Regina. As one of the major winners in your recent contest, I thought I would like to send you my very deep appreciation of the most generous gift of your company. I am truly sorry I was unable to take the trip owing to reasons which make it impossible for me to leave at the present time. The news of the award to me was indeed a great surprise beyond expectation. I have found very many valuable uses in my nursing experience for Palmolive."

## Book Reviews

**The Principles and Practice of Medicine.** Sir William Osler, Bt., M.D., F.R.S.; revised by Thomas McCrae, M.D. Twelfth edition. XXV and 1196 pages. Price \$8.50. D. Appleton-Century Co. Inc., New York and London, 1935.

This edition of "Osler" possesses for us a melancholy interest, in that it came to hand just a few days after the regretted death of its able editor. When a book has reached its twelfth edition it is unnecessary to praise it. "Good wine needs no bush". Osler's Principles and Practice of Medicine has always been a favourite both with students and practitioners of medicine on account of its directness, its scientific outlook, and its wealth of practical information. During the forty-three years that it has been before the profession it has preserved the spirit of its original author, and the editing that has become necessary with the passing of time has been done with a loving touch.

This edition has been completely reset; a new and slightly smaller type, but thoroughly legible, has been employed, so that in spite of the addition of much new material the complete work occupies actually less space than its immediate predecessor. It perfectly complies with the desiderata that its editor sets forth for a satisfactory text-book.

There are changes and additions in practically every part of the book, more particularly with respect to diagnosis and treatment. This is what one would expect and desire. To give a list of the new subjects dealt with would take up more space than we can afford. We would merely say that the work has been brought thoroughly up to date and is now fully comprehensive. The setting of the table of contents has, in our judgment, been much improved and will facilitate the location of desired topics. We are confident that the twelfth will prove more attractive than any of the earlier editions.

**Short Practice of Surgery.** Hamilton Bailey, F.R.C.S., Surgeon, Royal Northern Hospital, and R. J. McNeill Love, M.S., F.R.C.S., Surgeon, Royal Northern and Metropolitan Hospitals. Second edition, 987 pages, illustrated. Price 30s. net. H. K. Lewis, London, 1935.

The second edition of the "Short Practice of Surgery" requires no introduction. It already holds a high place in the list of standard text-books for medical students and general practitioners. The work is now included in one volume. There has been considerable revision and the subject matter has been brought up to date. The plan of the text is much the same as followed in standard works of this nature.

The first six chapters are devoted to the consideration of general surgical principles as applicable to the body as a whole. The remaining chapters consider specific organs and their diseased processes. The authors avoid all controversial subjects and present their matter in a clear and concise manner. The detail is not what you would find in a larger work but sufficient is given for the requirements of the student or general practitioner. The chapter on Thoracic Surgery and the section on the Sympathetic Nerve exemplifies this. There are many good illustrations and the type is clear.

**Practical Manual of Diseases of the Chest.** Maurice Davidson, M.A., M.D., F.R.C.P., Physician to Brompton Hospital for Consumption and Diseases of Chest. 528 pages, illustrated. Price \$12.50. Oxford University Press, London; McAlinsh & Co., Toronto, 1935.

This volume collects in a readable and well-produced form the essentials of a practitioner's knowledge of diseases of the chest. It follows the arrangement of



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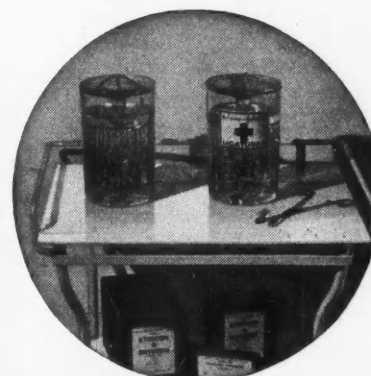
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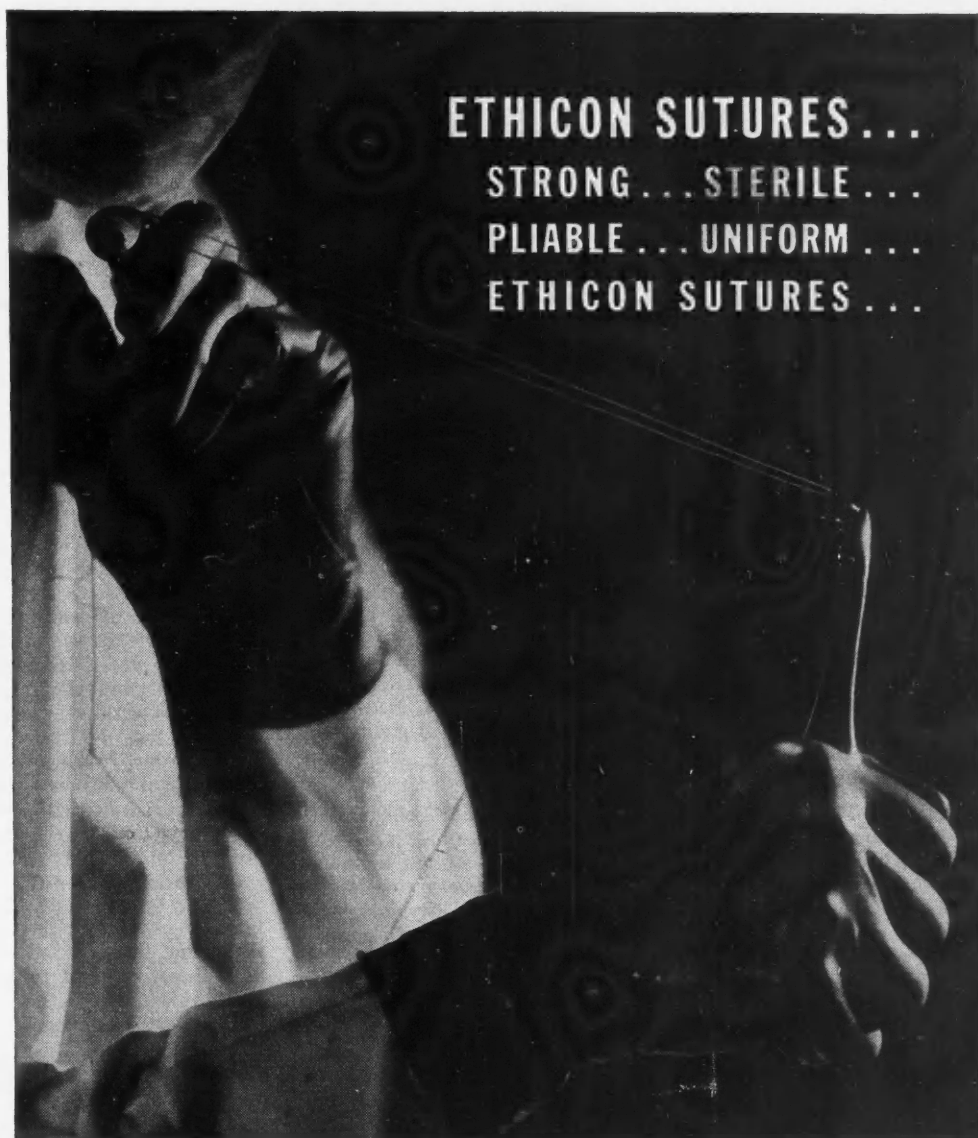
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the text-book on the whole, but much of the author's experience is built in. The section of vaccine treatment of asthma, for example, describes the practical difficulties excellently. Many text-books are apt to speak of vaccines with a respect that those who use them frequently do not have. This tendency to bring forward the practical everyday points in chest disease is well supported throughout the book. The author hints in his preface at the practical value of the old system of apprenticeship and would have us try to combine its virtues with those of our present method.

The book is well abreast of the latest work. The serum treatment of pneumonia, for example, receives its full meed of attention, the limitations and advantages being well summed up. Like all good teachers, Dr. Davidson lays less stress on the physical signs in the diagnosis of tuberculosis than on "careful synthesis of all the available varieties of evidence". The chapters on bronchiectasis and asthma are full and clear, and the many disputed points in these diseases are brought forward, with enough, but not too much, emphasis. Altogether the book can be strongly recommended to the general practitioner.

**Gynaecology for Students and Practitioners.** T. Watts Eden and Cuthbert Lockyer. Fourth edition by H. Beckwith Whitehouse, Professor of Midwifery and Diseases of Women, University of Birmingham. 964 pages, illustrated. Price \$11.40. Macmillan Company of Canada, Toronto, 1935.

This well-known work of Eden and Lockyer appears in a fourth edition, this time under the able editorship of H. Beckwith Whitehouse. Recent advances in gynaecology have necessitated a complete revision of the previous text, and two sections, *The Physiology of the Female Sex Organs*, and *Gynaecological Diagnosis*, are innovations. Modern views on menstruation and the relationship between the anterior pituitary, ovaries and endometrium are stated clearly and succinctly. The Aschheim-Zondek test for pregnancy is described. Under the heading of disorders of conception, dyspareunia, sterility, and the medical aspects of contraception are discussed in addition to ectopic pregnancy. In the section dealing with cancer of the cervix prominence is given to radium therapy, and instructions are given as to technique and dosage. Under diseases of the ovary space is devoted to granulosa-cell tumours (folliculoma) and luteinoma. The final part of the book deals with operative gynaecology, and only those operations which have proved their usefulness are described. The operation of Donald and Fothergill, of Manchester, is favoured for the surgical treatment of genital prolapse.

The format of the book is attractive, the type easy on the eye, and in addition to the coloured plates, there are numerous half-tone illustrations. This work may be unhesitatingly commended as a trustworthy guide, and the revision bears evidence of the editor's wide experience as teacher and consultant and his sound judgment.

**Diseases of the Skin.** S. Ernest Dore and John L. Franklin. 410 pages, illustrated. Price \$5.00. D. Appleton-Century Co., New York, 1934.

With the well known text-book "Diseases of the Skin" by the late Sir Malcolm Thomas Morris as a pattern, the authors have endeavoured to present a concise, comprehensive treatise on skin diseases, useful and convenient to both students and practitioners. The material is well arranged following the customary classification according to the type of lesion. The description of the individual diseases is excellent and the constant repetition of differential diagnosis serves to imprint on the reader's memory the outstanding features of the more common diseases. In many instances the etiology is presented in clear tabulated form. Good photographs with coloured plates not only enhance the value of any work of this nature but are essential

to its success. Unfortunately this book lacks such balance. Many of the plates are difficult to interpret as typical of the affections they represent. Representative photographs should not be difficult to obtain and one wonders why so many are omitted. Quite a few pages are used in the description of rarities, sometimes at the expense of the more common conditions. Treatment is placed on a sound basis, and a valuable dermatological pharmacopœia is appended which should prove useful to both students and practitioners.

**The Nervous Patient.** C. P. Emerson, M.D., Research Professor of Medicine, Indiana University, Indianapolis. 453 pages. Price \$4.00. J. B. Lippincott, Philadelphia, London and Montreal, 1935.

Dr. Emerson states in his introduction that this book is for general practitioners. He has tried to make available the conclusions of twenty years' reading and study. The effort is heroic, but rather unsatisfactory. To begin with, the scope of the book is too large to be covered effectively in 441 pages. This makes it almost useless as an authoritative reference for the general practitioner seeking practical information. On the other hand, so much space is devoted to theoretical, psychological considerations that the general practitioner will find the book extremely hard reading. The severest eclecticism characterizes Dr. Emerson's chapters on what may be called "mental mechanisms". Freud, Jung, Adler, Stekel, Watson, and Pavlov all appear, but in such a medley as to make one skeptical of truth anywhere. His classification of the psychoneuroses is arbitrary, and, to the reviewer's mind, misleading. The chapter on the psychoses is merely inadequate.

The chapters on the lungs and bronchi, the cardiovascular system, and special types of headache are extremely good, but the central nervous system is treated in a very sketchy and impractical manner.

As an attempt to enunciate a praiseworthy point of view this book is interesting and admirable. As a practical aid—never.

**Practical Neurological Diagnosis.** R. G. Spurling, M.D., Assistant Clinical Professor of Surgery, University of Louisville School of Medicine. 233 pages, illustrated. Price \$4.00. C. C. Thomas, Springfield and Baltimore, 1935.

Students and practitioners of medicine will find in this new volume a valuable aid to the understanding of neurological aspects of general medicine. The author has dealt with the anatomical and physiological basis and clinical interpretation of symptoms and signs. The practitioner will welcome such a clear and concise guide to a complete history and examination from the neurological standpoint, enabling him to give his patients the advantage of this investigation in the early stages of disease, detecting early signs before the condition has gone on to the final and hopeless stages. Neurological investigation has long been considered the problem for the specialist and omitted from the work of the general practitioner, a situation which can only be explained by the fact that the subject is not sufficiently emphasized and elucidated to the student. It is this condition which the author has attempted to correct in arranging this volume on neurological history, examination, cerebrospinal fluid studies, and the value of x-ray in diagnosis.

## BOOKS RECEIVED

**The Harvey Lectures.** By various contributors. Series 29. 262 pages. Price \$4.00. Williams & Wilkins, Baltimore, 1935.

**Manual of Medicine.** Sir Stanley Woodwark, C.M.G., C.B.E., M.D., F.R.C.P., Physician and Lecturer on Medicine, Westminster Hospital. Fourth edition, 619 pages, illustrated. Price \$4.50. Oxford University Press, London; McAlinsh & Co., Toronto, 1935.